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## ANCIENT GREEK MUSIC.

By C. F. Abdy Williams, M.A., Mus. Bac., Cantab. et Oxon.

I have often been asked the question, "How can we know anything about ancient Greek music?" or "How can any fragments of it that may be discovered be translated into modern notation?" The answer is simple enough. Of actual specimens of ancient Greek music, the existing examples may be counted on the fingers of the two hands, but a fairly considerable amount of its theory has come down to us in the works of Aristoxenus of Tarentum (who wrote treatises on harmonics and rhythm), Cleonides, Euclid, Nicomachus, Alypius (who has given us the complete notation), Gaudentius, Bacchius, senior, Aristides, Quintilianus (the anonymous writer), and finally Claudius Ptolemy and Plutarch. These authors flourished at various times, from about 300 B.C. to 200 A.D., the most ancient and the most important being Aristoxenus.

In addition to the works which are specially concerned with musical theory, we find scattered notices, of considerable

<sup>\*</sup>The principal editions of these authors are: Meibomius, "Antiquæ Musicæ Auctores Septem." 1652. Containing the text, with a Latin translation of Aristoxenus, Euclid, Nicomachus, Alypius, Gaudentius, Bacchius, senior, Aristides, Quintilianus. There are two books attributed to Euclid, the first of which has, however, been of late years attributed to Cleonides. J. Wallis, "Claudii Ptolemæi Harmonicorum Libri tres." 1682. Greek text with Latin translation. In this book are explained the transpositions of the modes and keys. Westphal, "Plutarch, über die Musik." 1865. Greek text with German translation and notes. F. Bellermann, "Anonymi Scriptio de Musica." and "Bacchii Senioris introductio." Berlin. 1841. Greek text with Latin notes. Westphal, "Aristoxenus, Melik und Rhythmik." Leipzig. 1883 Greek text with German translation and notes. Most of the above works have been translated into French and German, and are easily accessible in this form, though the original editions are out of print and scarce.

value, in the writings of Plato, Aristotle, and others, which, taken in conjunction with the treatises, enable us to reconstruct to some extent the theory of ancient music, though naturally not to reproduce it. Of actual examples, we have three hymns—to the Muse, to Nemesis, and to Helios—of the second century A.D.; a short hymn by one Seikelos, found cut on a pillar at Tralles, supposed to be of about 100 A.D.; a portion of the music to Pindar's first Pythic Ode, of doubtful authenticity; large portions of a hymn to Apollo, discovered engraved on stone at Delphi in 1893; considerable portions of a second hymn discovered later at the same place; and some vocal and rhythmical exercises, given as examples in the anonymous treatise.\* If the Pindar music is genuine it dates from 500 years before Christ. It was discovered about 250 years ago, and is now found to be composed in accordance with certain rules of construction which it was impossible that the discoverer could have known, so that it can scarcely be a forgery.

In speaking of Greek music it is usual to begin by a discussion of scales. We modern musicians make use of four forms of scale divided into two modes—namely, the major scale or mode, and the minor mode in its three forms of ascending melodic scale, descending melodic scale, and harmonic scale.

The major scale or mode consists of two similar tetrachords ascending by tone, tone, semitone, and separated by a tone. The ascending minor scale cannot be divided into tetrachords. The descending minor consists of two tetrachords, proceeding downwards by tone, tone, semitone. These tetrachords are joined together—that is, the lowest note of one forms the highest note of the next; these are what the Greeks would call conjunct tetrachords. The scale is completed by the addition of a note an octave below the top note. The descending melodic scale is of great importance to the subject of this paper, for if we play two octaves of it we get exactly the ancient Greek greater perfect system, or complete scale, which could be transposed to any pitch, and out of which the modes were formed. The note added below the lowest tetrachord was called proslambanomenos; and those who named our scale sounds A B C D E F G, took the proslambanomenos, the lowest sound of the Greek system, as their starting point, and called it by the first letter of the alphabet.

The chief peculiarity of the modern harmonic minor scale is the augmented second; and this interval is also the chief peculiarity of the ancient and the modern Greek chromatic

<sup>\*</sup>The whole of the Greek music at present known to us will be found in the original and in modern notation in Gevaert's "La Musique de l'antiquité." Vol. I. Ghent. 1875, and "La Melopée antique." Ghent. 1895.

scale. Greek theory has had more influence on European music than most musicians are aware of. To mention only a few out of hundreds of evidences of this, we find in Prætorius that some of the early mediæval organs had as their lowest note B natural, not A, as we might expect; and the reason given by him is that B natural was originally the lowest note of the Greek system, the A being added afterwards.\* Going back still farther we find musicians of the ninth and tenth century of our era singing in consecutive fourths, fifths, and octaves, and these intervals are described by Greek theorists as "symphonies," or notes that could be sounded together, other intervals being "diaphonies" or discords. Is it not possible that musicians were led to these early experiments in combining sounds by their study of Greek music?† We go farther back and come to Boethius, who quotes some of the Greek notation, but uses Latin letters for his own purposes, though he does not use them in the same way as his successors. It is in his work that we first find the Gregorian modes arranged in their well-known order; but it is unfortunate that he got confused in his description, and misnamed them all. In any reference therefore to the names of these scales or modes I must ask you to bear in mind that I refer to the Greek use of the terms, not the Gregorian.

Perhaps it will be as well to mention some of these: but to

name the whole would be only confusing.

The Greek modes then were called Dorian, Phrygian, Lydian, Mixolydian; but they went in exactly the reverse

order to the Gregorian, as described by Boethius.

The Greek Dorian octave or mode commenced on E, the Phrygian on D, the Lydian on C (our C major scale), the Mixolydian on B, the Hypo-Dorian on A, the Hypo-Phrygian on G, the Hypo-Lydian on F; all these modes being, in their diatonic form, represented by the white keys of the piano. These were the seven oldest modes, and I need not trouble you with other names. Aristoxenus, however, who lived at a time when music must have arrived at a considerable

\* Prætorius, "Syntagma." 1618. Vol. II., p. 113. "Allheir lässt sichs ansehen, als dass sie zu den Orgeln anfangs nicht mehr als diese eilf claves, darinnen die Alten die drei tetrachorda comprehendirt, genommen haben; als I. Tetrachordum hypaton, von padarato bis ins E. . . 2. Tetrachordum meson vom E zum A. 3. Tetrachordum diezeugmenon von pins e.

## CDEFGAQCde

† Thus, for example, Gaudentius, p. 11., explains "harmonious" sounds as unisons, consonances, and paraphones. Unisons are when two sounds which do not differ in pitch are struck simultaneously. Consonances are perfect fourths, perfect fifths, and octaves. Paraphones are intermediate between consonances and dissonances, as augmented fourths, major thirds.

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† See "Dictionary of Greek and Roman Antiquities." Third edition.

Art., "Musica." Or any recent work on ancient music by, e.g., Chappell,

Westphal, Gevaert, &c.

stage of development,\* instituted thirteen keys, and for this purpose divided the octave into twelve equal semitones, and each note of the octave thus divided formed the proslambanomenos, or starting point of a key. I must point out that "mode" means the division of a single octave into tones and semitones; "key" means the particular pitch of the two octaves forming the greater perfect system. Aristoxenus got as much abused for his innovation by the Pythagoreans as the advocates of equal temperament have been abused by the scientists of our own times. Later on the thirteen keys were increased to fifteen, but this does not concern us.

The single modes were therefore not confined to a particular pitch, as in the Gregorian system. On the contrary, just as with us the major and minor modes may start from any white or black note, so in classical Greece the Dorian, or Phrygian, or Lydian, or any other mode could occur on any of the twelve sounds of the octave. Differences of pitch were unfortunately called t by the same names as differences of mode, and considerable misconception has therefore arisen, some scholars even contending that differences of mode were merely differences of pitch for the greater perfect system. This, of course, cannot be the case, for mode gave character with the Greeks as with us, and we know that to change a piece in the minor mode from the key of C to that of D or E does not change its character, whereas to change a piece from minor to major does change its character, whether we change its pitch or not; and so it was with the Greeks. Hence a Greek composition could be in the Dorian mode and the Lydian key, or vice versa, or there could be any other combination of key and mode. As an example, the Delphic hymn to Apollo is in the Dorian mode and the Phrygian key, the latter being shown by its notation.

I will take this opportunity of saying a few words about the Greek notation. Without going into details, I may say that it was alphabetical and had two forms, one being used for voices, the other for instruments. In the treatises, where notation is used, both forms are generally given together, but in the existing fragments of composition only one form is used at a time, and apparently the two forms were interchangeable, or were used indifferently for voices or instruments in actual practice. Alypius gives complete tables of the notation of the two octaves forming the greater perfect system in all the fifteen keys. That is to say, each proslambanomenos is a semitone higher than its predecessor

<sup>\*</sup> Aristides Quintilianus, p. 22, &c. The twelve equal semitones of Aristoxenus are discussed by Westphal in various places.

† See Claudius Ptolemy. Book II., Chapters 7 and 11.

; See Gevaert, "La Musique de l'Antiquité." Vol. I., Book ii., Chapter 3.

(Fig. 3), and the fifteen keys are merely a transposition of the same two octaves. But as there are three forms of scale—viz., diatonic, chromatic, and enharmonic—there are forty-five tables of notation. He calls the complete scale in each key a "trope," the "mode" being only a portion of the

trope.

In translating a piece of Greek music it is first necessary to make a table of all the signs used in the piece, and then see to which trope, as given by Alypius and the other theorists, they belong. I show you a plan of portions of the complete notation (Fig. 2). A scheme such as this was called catapycnosis, and formed an important branch of musical teaching in ancient days, though Aristoxenus condemns a reliance on the catapycnosis as misleading.\* In each tetrachord the highest and lowest sounds were "fixed" and the two middle sounds were "moveable"—that is, they were differently tuned according to the different genera, the diatonic, chromatic, and enharmonic. For the ordinary chromatic tuning the third note from the bottom was lowered by a semitone, thus producing, for example, e f gb a. While for the enharmonic, the third note was lowered by a tone and the second by a quarter-tone, producing two quarter-tones and a major third. There were also other refinements of tuning which would take too long to explain here.

The so-called instrumental notation is shown by Westphal to consist of the letters of an early Greek alphabet, showing traces of Phænician origin (Fig. 1). The scale, however, is not arranged in alphabetical order, but, starting from the top A with Aleph (the first letter of the alphabet), the succeeding letters produce a curious succession of octaves, which can only be accounted for by some order of tuning the instruments unknown to us. The three lowest notes of each chromatic and enharmonic tetrachord are represented by a sign in its ordinary position, then on its back, then reversed; but where it is impossible to reverse a sign, such as the letter H, its form is changed (Fig. 4, a, b). For notes beyond the compass of the first alphabet the letters are mutilated. The vocal notation (Figs. 2 and 4) consists of the capital letters of the Attic alphabet, which, taken in their proper order, give a complete octave in the enharmonic genus. For notes above this octave the letters have a special mark on their righthand top corner, while for those below they are mutilated. The signs in both notations are the same for chromatic and enharmonic genera, and one note only in each tetrachord has a different sign for the diatonic genus (Fig. 4). I have explained this in more detail in No. 9 of the New Quarterly Musical Review for May, 1895.

<sup>\*</sup> Aristoxenus (Meibom.), pp. 38 and 39.

The Greeks did not develop music to the pitch at which it has arrived in modern times, but they certainly laid the foundation of our modern art. They knew nothing of combining melodies simultaneously; but it is only natural that their keen perceptions should lead them to a high cultivation of music in some direction or other. We have seen that they used a great variety of modes and genera and tuning, all of which would affect the melodic side of music; but, they said, melody is only one part, and music cannot be complete without rhythm. Melody and rhythm combined produced music.

About 300 years ago there was invented at Florence a new kind of music for dramatic purposes called recitative. It was without rhythm, and its inventors supposed that it was a reproduction of ancient Greek music. But the discovery, in 1790, of a lost treatise on rhythm by Aristoxenus goes to show that all Greek vocal music was sung in regular rhythm and there was no such thing as recitative. The rhythm appears to have been more complex in some ways than ours, and there were refinements, of which we take no notice, though our great composers and our best performers, without theorising, seem instinctively to feel them. Thus the Greeks were very fond of 5-time rhythm, a thing so rare in our music that it is passed over in the instruction books as non-existent; yet we know from Tschaïkowsky's "Pathetic" Symphony that it is quite practicable and very effective. They also seem to have made use of a variety of phrase practically unknown to us, who base all our compositions on phrases of four bars, or multiples of four, and but rarely make use of three, five, and seven-bar phrases. Then again they observed the accentuation of phrases as well as of bars: a phrase, they said, beginning with a weak accent and leading to a stronger one was more vigorous than a phrase beginning with a strong accent; for in the first case there was, as it were, an increase of energy, and in the second a decrease. The difference is often perceptible in modern music, though of course the element of harmony (which was unknown to the Greeks) considerably modifies the purely rhythmical effects. There are passages in Beethoven's works in which the composer has taken it for granted that the performer will instinctively use the right accentuation, though his notation gives no clue to it. Thus, in the second movement of the Sonata, Op. 27, No. 1, the application of the Greek rule about rhythmical accents in the phrase will show that Beethoven seems to have thought of the movement in 6-4 time, beginning with a half-bar, though he writes it in 3-4. I will play it with a somewhat exaggerated accent to make my meaning clear.\*

<sup>\*</sup> See Prout's "Musical Form," p. 15, for other examples.

Then there was the phrase that was preceded by a single bar or portion of a bar, a redundant bar; there was the irrational bar—that is, a bar which had no proportion to the other bars; this is indicated by our pause; and there were other features too complicated to mention in the limits of a short paper. There was also syncopation or displacement of the accent, all of which things are described in Westphal's and Gevaert's books.

With regard to the laws of composition, so far as we know them from theory, and from the existing fragments, the chief note of a scale was Mese, the middle note of the ancient heptachord, which in the complete system of sounds corresponded with the A to which we tune our violoncellos. The actual pitch is, however, supposed to have been about a minor third lower than ours. Aristotle gives us to understand that Mese is the note which in all properly composed songs occurred most often; and that composers always quickly returned to it if they left it.\* It also seems to have been the note from which the strings of lyres and kitharas were tuned, and from Aristoxenus we gather that they were tuned by fourths and fifths as a modern harp would be.† The note called Hypate was a perfect fourth below Mese—and from a passage in Aristotle's problems Helmholtz and others have concluded that melodies ended on this note; and their conjecture has been as good as confirmed by recent discoveries. It has been the custom to speak of Mese as a keynote and Hypate as a dominant, and to say that Greek melodies ended on the dominant. I very much prefer however to consider Mese in the light of a Gregorian dominant, a note round which the melody revolved, and to which it constantly returned, and the Hypate as a Gregorian final. I have stated my reasons for this view in a recent number of the Classical Review, and will, therefore, not enter into it here.!

Another rule has been observed by Mr. Monro and Professor Crusius, though it is not referred to in any of the ancient treatises. The rise and fall of the melody is indicated by the grammatical accents of the words—that is to say, a syllable bearing an acute accent is sung to a higher note than the succeeding syllable, and a syllable bearing a circumflex accent is frequently sung to two notes, the second note being lower than the first (Fig. 5). The intervals affected by the grammatical accents may be of any compass, from a second to a sixth or octave, so that the composer had a certain amount of freedom of choice. I have not found a seventh. The

<sup>\*</sup> Aristotle. Problem xix., and elsewhere.

<sup>†</sup> Aristoxenus, p. 55. † The Delphic and Tralles Hymns show evidences of this construction. See Classical Review, March, 1898.

reason of the rule is apparent from a passage in Aristoxenus, in which he compares the rise and fall of pitch in the speaking or declaiming voice with the same rise and fall when regulated by musical intervals.\* The latter, he says, is musical melody. Students of Gregorian neumatic notation will see a close connection here between the Greek grammatical accents and the simplest form of neumes, as explained by Don Pothier.† A short syllable is (in the existing fragments) invariably sung to a single note, while a long syllable has one, two, or even, though rarely, three notes of melody. The rhythm of the music is dominated by the metre of the poetry, and if we translate the note over a short syllable by a quaver, we must translate that over a long syllable as a crotchet. A melody composed for Greek words, therefore, differed from one composed for modern words in this important point; in the Greek melody short syllables must have short notes, long syllables long notes; with us the length of note is a matter of indifference as long as accented syllables coincide with accented notes, and unaccented syllables with unaccented notes. In the anonymous writer we find signs given for notes of the value of one, two, three, four, and five chronoi or time values, the single chronos being usually translated by a quaver. "Anonymus" also gives signs for what he calls "chronoi kenoi"—that is, "empty times," or, as we should say, rests, of values from one to five.

Bacchius, senior, and others speak of change of "Mese." This would amount to change of mode or change of key, or, as we should say, modulation. There were also frequent changes

of rhythm.

The vocal melody was always sung in unison or octaves, but there was usually an instrumental accompaniment. Plato, in his laws, wishes boys to be taught to play the instrument in unison with the voice, and not to play a different melody, as was done by professional musicians.

"Anonymus" speaks of Croumata, or instrumental introductions to songs, and of Cola, or short instrumental passages interspersed between vocal portions—these would, of course, correspond exactly with the "symphonies" of a modern song or chorus. Aristotle and Plutarch make reference to some of the intervals used in the accompaniment, such as the second, fourth, fifth, major sixth, and they distinctly tell us that the accompaniment was always above the melody. Gaudentius also mentions the major third and augmented fourth as intervals used by the instrument in accompanying.§ It is evident, then, that though the Greeks sang in unison,

<sup>\*</sup> Aristoxenus, p. 8.

<sup>†</sup> In "Les Mélodies grégoriénnes," ch. 4. Tournay. 1881. † Anonymus, p. 78. Gaudentius, p. 23. Aristotle, Problem xix., &c. § Plutarch Chapter xiv. Aristotle, Problem xix., 12, &c. Gaudentius, p. 11.

they made use of some kind of very elementary harmonic accompaniment. Aristotle calls this "mixis," our word mixing or mingling; but he says that the mixis did not affect the character of the music, for character was produced by the melody alone.\* With us, of course, the mixis or harmony has a very strong effect on the character of the

composition.

Various passages in the ancient treatises refer to the "systems." I have already mentioned the greater perfect system of two octaves. There was also the lesser perfect system of an octave and a fourth, from A to D, in which the B was replaced by B flat, in order to preserve the sequence of tetrachords. (This system, of course, suggested to the early Gregorians their B flat, which was the first black note introduced on the organ, the second being E flat.†) But apparently almost any combination of a few notes could form a system, 1 and the systems seem to have taken something like the same place in melodic design as the ragas of South India namely, a sort of pattern on which the melody was composed. Systems were either regular or irregular. If regular, they consisted of an ordinary succession of a few notes of the scale; if irregular, one or perhaps more notes were omitted. I quote two systems from the "Hymn to Apollo," one pentachordal (Ab, C, D, Eb), the other tetrachordal (Eb, G, Ab), and both are irregular, for a scale note is omitted in both (Fig. 5, a). The Pompeiian flute, which we imitated for the Bradfield Greek Theatre, when discovered, was arranged to play two irregular systems, one pentachordal (B, C#, D#, F#), the other tetrachordal (F#, A#, B), and, in addition to these, there were C,  $C_*$ , D, above the upper B (Fig. 5, b). The other holes of the instrument were closed, leaving only these systems to be played with the fingers. The modes also were called octave-systems.

The form of a Greek chorus was important and well defined. It consisted of strophe, containing a number of lines of irregular length, technically called verses. The verses and their divisions formed the musical phrases, just as do the single lines of a modern hymn-tune; though the Greeks knew of no such cut and dried regularity of form as this. To the strophe succeeded the antistrophe, which, in rhythm, metre, and every particular was an exact imitation of the strophe; and even the grammatical accents correspond in the two portions so nearly as to make the same melody possible for both. To the antistrophe succeeded the epode, a shorter piece in a different rhythm, usually anapæstic—that

<sup>\*</sup> See Gevaert, "La Musique de l'Antiquité." Vol. I., p. 336.

<sup>†</sup> Prætorius' Syntagma, p. 108. ‡ Aristoxenus, p. 16. Gaudentius, p. 4. Bacchius, p. 2. Aristides, p. 15. Anon., p. 30.

is to say, in common time, beginning with the half-bar, as in a gavotte. This construction was repeated if the chorus was of any considerable length. A passage in Aristotle's nineteenth problem leads us to the inference that the strophic and antistrophic construction was used for the chorus on account of its being easy to learn; for the two principal portions had the same rhythm, were in the same mode, and apparently had the same melody. You will see then that the element of

design was not at all absent from Greek composition.

The Greeks knew of a considerable variety of instruments, many of which, however, they looked upon as barbarous, or only fit for accompanying festivities. Of stringed instruments there was the monochord or canon, used only for acoustical experiments; the trichord or pandoura, a kind of lute with a neck, on which the fingers could stop the strings, like the nefer of the Egyptians; the trigon, probably a harp, with a large number of strings, and what was called a panharmonic scale, or a scale capable of playing all the harmonies (I must explain that the word harmony in Greek meant mode); the pectis, an instrument of high pitch, used only by women: the magadis, in which the strings were divided by a bridge in such a way as to produce a note and its octave. Anacreon accompanied his songs on a magadis of twenty strings. The Phoenician lyre and sambuca were of the same nature as the magadis (Gevaert, Vol. II., p. 245), and there were several other varieties of which only the names have reached The chief stringed instrument, and the only one used in the theatre so far as we know, was the kithara, an improved form of lyre, whose tone was like that of a very small harp. It took many shapes and names, but the principle was the same in all—namely, a sound-box on each side of which were arms supporting a cross-piece or yoke, to which the strings were attached; the strings passed from the bottom of the sound-box over a bridge to pegs in the yoke, by which they were tuned. Our Bradfield reproductions of this instrument prove that the tone was more penetrating in the open air than one would expect.

Of wind instruments there was also a considerable variety. We frequently see representations of double flutes. These seem to have been chiefly used in sacrificial ceremonies, for with the Romans, and probably with the Greeks, no sacrifice could take place without the music of flutes. Varro tells us that the right flute was differently constructed from the left, but in such a manner as to join with it; for the first played the principal melody, the second the accompaniment.\* I must mention, however, that the word aulos, usually translated flute, in reality referred to reed instruments of various kinds. I believe it is doubtful whether the principle of the flauto

<sup>\*</sup> Gevaert. Vol. I., p. 364, Note. Vol II., p. 292.

traverso or fife was known. There is certainly a statue in the Vatican of a boy playing a fife, but M. Victor Mahillon told me that he considered it a restoration. The syrinx, or panpipe, and the bagpipe appear to have been used chiefly by shepherds. The wind instrument used in the theatre and in musical contests was the single aulos, and this was able, by means of plugs, or wax, or other contrivances to produce, like the trigon, the panharmonic scale.\* condemned on this account by Plato, who would restrict the number of modes used in order not to encourage luxury or effeminacy in music. For, he said, music ought to be severe and simple in order to produce strength of character. The grammarian Didymus, quoting from a lost treatise of Aristoxenus, describes five classes of aulos—namely, auloi parthenioi, auloi paidikoi, auloi kitharisterioi. These three classes were called feminine, and from their names would appear to have been used by women and children. The auloi teleioi, or perfect, and the auloi hyperteleioi, or more than perfect, appear to have had a compass corresponding to our tenor and bass voices. They were called masculine. Herodotus makes the following allusion to auloi: "Alyattes, King of Lydia, made war against the Milesians. He led his army into their territory to the sound of the syrinx, the pectis, the feminine aulos, and the masculine aulos."

Of military instruments we have mention of the salpinx, a straight trumpet; the lituus, a sacerdotal trumpet, curved at the end something like the letter J—a fairly well preserved specimen of the latter is in the Vatican museum; the cornu, or horn, which was curved in such a manner as to go under the performer's left arm, while the bell was over his head. Some of these instruments were found at Pompeii, and are

preserved in the Naples Museum.

In conclusion, I will say a few words about the music at the Bradfield Greek Theatre.

It is the aim of the Warden, Dr. Gray, as far as possible to reproduce in all essentials the theatrical performances of the time of Æschylus, Sophocles, and Euripides. The theatre is a copy of an ancient one, the ground plan being taken from the theatre of Epidaurus, the best preserved specimen. The only features that are omitted are the masks and buskins, which are not required in so small a space.

It is evident that a modern orchestra with all its richness of effect would be out of place, for not only would there be no space available, but it would be entirely out of keeping with Greek ideas to make the music the most prominent part of the performance, as in the modern opera or music-drama.

<sup>\*</sup> For further information on the ancient lyres and flutes see Gevaert, "La Musique de l'Antiquité." Vol. II., Book iv. Chapter 1.
† See "Dictionary of Greek and Roman Antiquities," sub voce, "Tuba."

When Dr. Gray approached me on the subject, I thought that something ought to be done to make the music as much in keeping with the surroundings as possible. Not a note of the ancient theatrical music exists, except a very mutilated fragment of Orestes; but we have all the words of the dramas. we know which portions were sung by the chorus, we know the form of the instruments, and we have, as I have shown you, a considerable portion of their theory. I persuaded Mr. Blaikley to make me four auloi, taking as his model the specimens found at Pompeii, one of which has been reproduced by M. Mahillon. The original is panharmonic, with a compass of B to D, the holes being closed and opened by metal cylinders which fit closely round the instrument; but these would be too difficult for schoolbovs to use, so they were omitted. I then, with the help of Messrs. Hill and Son, the violin makers, transformed five Spanish lyre guitars into real kitharas, and tuned them to the Dorian octave. Properly speaking, the lowest string ought to be farthest from the player—in ancient times the lower strings played the melody, the higher the accompaniment; but as this arrangement would necessitate the playing of the treble with the left hand and the bass with the right, I have reversed the order of the strings to bring the instrument more under the control of modern players.

With the exception of myself, all the nine instruments forming the band of the Greek Theatre are played by school-

boys, the kitharas being allotted to violinists.

In composing the choruses I have adhered as far as possible to the Greek methods in following the grammatical accents, in the use of mese and hypate, in the systems, in the introduction of croumata, and in the strophic and anti-strophic construction, which is, I believe, peculiar to Greek poetry. I have strictly followed the metrical construction worked out by Schmidt and Professor Jebb, and have endeavoured to use the modes in both the diatonic and chromatic Of course, modern harmony is impossible with instruments of only nine strings, but I have tried to make the accompaniment as full as possible on Greek methods. I have freely introduced the Greek chromatic scale with its augmented seconds and fourths, and find the boys have very little difficulty in singing these intervals, probably because there is an entire absence of modern tonality, and therefore no feeling after modern harmony. I have, in fact, done all I can to produce local colour by simplicity, severity, and an application of what is known of Greek theory. Those who are disposed to undertake the journey to Bradfield next June will, I know, be sure of a welcome from Dr. Gray, and I can promise them that whether the music meets with their approval or not, they will, at any rate, see an excellent performance and a very beautiful sight.

Fig. 1. The instrumental notes of the Greater Perfect System:—



Fig. 2. Part of the Catapycnosis:—



N.B.—The sign = represents that a note is  $\frac{1}{4}$  of a tone sharper or flatter than written, according to whether it is above or below.

Fig. 3. The Proslambanomenoi of the 13 keys of Aristoxenus:—

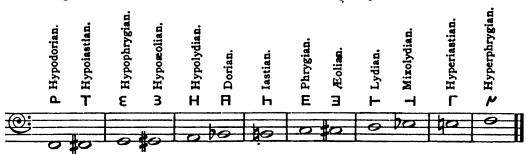


Fig. 4. The Dorian trope in its three genera:—

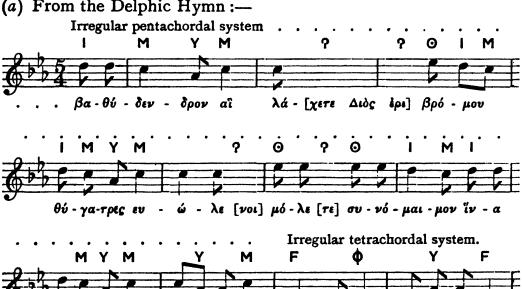




In this diagram open notes represent fixed sounds, black notes moveable sounds.

## Fig. 5. Systems and accents:

(a) From the Delphic Hymn:—



ψη, - τε χρυ - σε - ο - κό-μαν

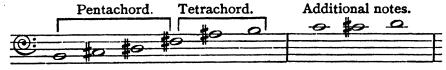
The same system transposed an octave higher.

φοί - βον ψ



δαεῖ - σι μέλ

(b) Systems found arranged on one of the Pompeiian flutes:—



In Ex. (a) the words in brackets are restorations, the stone being broken in these places. When a syllable is to be sung to the same note as the preceding syllable, the musical sign is not repeated.

### DISCUSSION.

THE CHAIRMAN.—In introducing Mr. Abdy Williams I should have mentioned his connection with Bradfield College, but the lecture itself brings out that point. The study of Greek music is something more than an antiquarianism, for Greek music represents the first scientific and intellectual stage in the great chain of our musical history. It is true that there is Hindoo music, remaining to our day, which is older than Greek music; but we are dealing here with the European question. The classical period of Greece has been called the adolescence of intellectual and modern man, and a very beautiful adolescence it was. Unfortunately it has departed. As Goethe says, "the May of life blooms but once." Now the mental attitude of this adolescent, this Greek of classic times, was very little subjective, and a great deal objective. He concerned himself that is to say very little with his own sensations, in the way that we do, and much more with outside nature and its laws and conditions. I strongly doubt whether there was much or any human emotion in Greek music, but imagine that it contained rather a great deal of observance of method and rule, carried out in a refined way. If this is so, the study of Greek music, while forming a necessary step in our consideration of general musical history, has been a subject peculiarly fitting for a scholastic institution like Bradfield. There were one or two technical points on which I should have liked to hear the lecturer say more; as for instance on the descending nature of the Greek scales, and on the formation of the "complete system" by a conjunct tetrachord added top and bottom to the two disjunct tetrachords, with a substitute tetrachord patched on as it were in the middle to make modulation to the subdominant; and so on. But without embarking further on these technical matters I will here move a vote of thanks to Mr. Abdy Williams for his interesting lecture.

This was carried unanimously.

Rev. O. J. VIGNOLES.—This subject seems to me to be one of great complexity and obscurity, and I should like to know what is the common-sense view of the development of the modern diatonic scale, which, in my opinion, has been worked out by various improvements from the early Church music. I cannot help thinking (I have only read a little about it) that it is a very difficult subject, and I may say in passing that to produce an exposition of the historical as well as the theoretical part of this question would be a very great gain; and I, for one, should like to be helped over many dark and complex details, especially the correspondence between the

notation we have as compared with that clumsy system which preceded it. I cannot help thinking that both in harmony and melody the ancient method must have had very rough and informal intervals, judging by the examples we have of Eastern music, which are almost unintelligible to us.

Mr. Southgate.—Perhaps I may be permitted to answer Mr. Vignoles. I can assure him that we are not treading on uncertain ground; we now know a good deal about Greek music and the materials on which it was built. And we can go back a long time anterior to the period about which Mr. Abdy Williams has been dealing. Two thousand years before then we have ample evidence of the flourishing condition of music in ancient Egypt. Indeed, I am inclined to think that far too much credit has been given to the Greeks for their music and invention in that art. As a matter of fact, the Greeks derived their music and instruments from the land of the Pharaohs. Pythagoras went there to study, and he brought back with him to Greece much of the knowledge current in Egypt. He found there both the diatonic and chromatic scales as we now know these ladders of sound. have catalogued some twenty of the instruments in common use; we can see all these pictured on the walls of the tombs. I say without hesitation that these instruments exceeded in number, in compass, and in variety the instruments which Greece possessed in her most palmy days. And, moreover, in various European museums we have several fragments of the instruments taken from the tombs. Perhaps I may remind our members that when I had the privilege of reading here a paper on Egyptian music, Mr. J. Finn played on a pair of double flutes taken by Dr. Flinders Petre from the tomb of Lady Maket, in the Fayoum (1800 B.C.). It was then perceived that our scale of to-day and that of the ancient Egyptians were practically identical. From the instruments it is not difficult to deduce the music. I suspect that the popular music and the trade cries of those we hear to-day who sell melons, water, &c., in Upper Egypt differ little, if at all, from what was current in Egypt 4,000 years ago. In common with many others I thought this ancient people possessed quite a different scale of sounds; but the evidence of these Lady Maket flutes, and of a still more extraordinary example of the clarinet type taken from the pyramid of Akhmin, and now in the possession of M. Maspero, of Paris, on which the complete chromatic series of notes, together with an enharmonic seventh, can be obtained, is indisputable evidence of the possibilities of music long, long before the Greek period. Moreover, the wall frescoes show us many examples of the orchestral combination of their instruments. In the well-known flute concert from Gizeh there are eight players, using, by the way, flutes of the nay pattern, all

differing in length. I need scarcely point out to musicians the significance of this as bearing on the question of ancient harmony. And this is not the only example of bands. one instance, in a funeral ceremony (from a tomb in Thebes), there are six players, each performing on a different instrument. I know of no such Greek record, pictorial or literary, showing such an advanced condition of music as all this represents, and I have mentioned it in order that Mr. Vignoles may see that long before the time Mr. Abdy Williams has been speaking about, a much more complete and copious form of music existed, and, it seems, must have been known to the cultured Greeks. I am unable to agree with the theory that the double flutes, the diaudos of the Greeks, were principally used in connection with sacrificial purposes. You can see and will note to the contrary plenty of examples on gems, coins, vases, and sculptures. In the British Museum there is a bas-relief from Nineveh representing large bands of harpists, players on the dulcimer and double pipes, with singers and time-beaters, taking part in a triumphal march; and in the same Museum is also a good exemplification of the use of the double flutes. On the righthand side of the long Egyptian Gallery (ground floor) is an actual fresco cut from a chamber in one of the pyramids and attached to the wall, Here you will find a girl playing these double pipes; she is gorgeously dressed as the chief musician in a little band, playing for the delectation of some guests at an evening party. The ladies are sitting at small tables, with fruit and flowers before them, listening to the music. There are many similar representations of the playing of these pipes—always, by the way, played by a woman; rarely, so far as my recollection goes, used at sacrificial ceremonies and you will remember that, according to the statements of some of the Greek writers, instruments of this type were used at the performances in their theatres.

Mr. Blaikley.—Mr. Southgate has spoken with great certainty about the notes produced on ancient flutes and, to a certain extent, I agree with him; but it appears to my mind in connection with the playing of all common instruments with side holes, that the pitch of a note coming from any open hole depends upon how many holes are covered below it. In the trials referred to we raised the fingers from each hole consecutively and noted with accuracy the pitch of each sound, no hole below the speaking hole being covered; but it is quite possible some of these notes were, in the actual use of the instrument, played with one or more covered holes below. One point which struck me very much is that the division of the interval of the fourth seemed rather like our D, E, F, and G, as given by the natural notes of the trumpet, than the division of the perfect fourth with a semitone between

E and F; but suppose the finger closed the hole below the trumpet F, we would get very close to the modern division of the perfect fourth. To my own mind there may be more connection with the horn or trumpet scale than has been assumed in this ancient music; but I quite agree with Mr. Southgate that you can get the perfect F if you close a hole or holes below the speaking hole. Then, with regard to the possibility of roughness of finish, I do not agree with that idea, but think that, whether Egyptians or Greeks, they knew exactly what they were doing. I judge thus from the characteristics of instruments that have been found, both those Mr. Southgate alluded to and those in the British Museum; each one is beautifully finished, the finger-holes especially beautifully cut and finished, and they had evidently been adjusted to give the notes required, not roughly, but with an aim at exact and precise results.

Mr. Southgate.—It is very true what Mr. Blaikley said, you find some of the nays so, there is one in the Florence Museum beautifully made; but if you look at the modern Egyptian nays you will see that the holes are very roughly

and badly made.

Mr. ABDY WILLIAMS.—Ladies and Gentlemen, I must first thank you for the kind way in which you have listened to my paper on a somewhat abstruse subject, and for your vote of thanks. With regard to Dr. Maclean's question, the history of the growth of the Greater Perfect System would be too long to explain in detail. It consists of the gradual addition of tetrachords above and below the original one, which can be represented by our notes E, F, G, A. First, a conjunct tetrachord was added above A, Bb, C, D, and this resulted in the heptachord, to which the seven-stringed lyre was tuned, and the middle note of which was Mese; then a conjunct tetrachord was added below B, C, D, E, and the Lesser Perfect System was completed by the addition of the Then a disjunct tetrachord, B, C, D, E, was bottom A. added above Mese, and another conjunct, E, F, G, A, above the last, and the result was the Greater Perfect System. Every note of each system had its own special name, and each tetrachord was called by a special name; but with these I need not trouble you. The Greek tendency to begin a scale at the top instead of the bottom has often been noticed. Aristotle perhaps refers to it, when he says that it is easier to sing from a high to a lower note than from a low to a higher one; and another sign of this tendency is in the fact that the melody usually ended on Hypate, a fourth below the principal note Mese. You will observe that the principal mode, the Dorian, proceeds downwards by precisely the same order of intervals as our major scale proceeds upwards—viz., by tone, tone, semitone. I imagine that the introduction of modern

harmony had something to do with this somewhat remarkable In reply to Mr. Vignoles' question: The coincidence. intervals are most carefully explained in their mathematical proportions by Euclid, Nicomachus, Claudius Ptolemy, and others, while Aristoxenus gives us other explanations which Thus he shows that a fifth is to be cannot be gainsaid. tuned by ear, a fourth by ear, and a tone is the difference between them. He represents the empirical, artistic side of music, as opposed to the scientific or mathematical side. In dividing his octave by ear into twelve equal semitones, he does exactly what the modern piano tuner does, when he tunes in equal temperament. The scientific system (worked out on the monochord or canon) answered perfectly for a period in which only a few keys are employed; but directly free modulations were required, as was the case at the time in which Aristoxenus lived, an unscientific division of the octave into twelve semitones became just as much a necessity for the Greeks as for us. Middle Ages did not slowly develop the scale and then read into Greek authors their own views. On the contrary, they derived their theories through Boethius from the Greek theorists. One striking evidence of this is the fact that I have mentioned—viz., that the early organs, as described by Prætorius, had their keys tuned and named from Greek theory; and dozens of equally patent evidences might be adduced. With regard to the translation of the notation. Since we get the exact mathematical proportions of the notes and the name of each note from the writings of the Pythagoreans, and since Alypius gives the musical sign for each note against its name, and not only the sign, but a verbal description of it, there can hardly be a doubt about the translation of Greek notation into its modern equivalents. If Alypius, for example, says that Mese is represented by a certain sign and that Hypate is represented by another sign, and we know from other writers that Hypate and Mese are at the distance of a perfect fourth, it stands to reason that the notes E and A, or their equivalents, will represent Hypate and Mese; and the same reasoning applies to all other intervals. I have mentioned that the actual pitch is not known, but this is immaterial as long as we know the proportions of the intervals. It is convenient to refer everything to our scale of A minor, as it involves no sharps or flats; but, as a matter of fact, when the tropes have been worked out completely the Dorian trope is found to correspond with our B flat minor scale, and the mode therefore is represented by F to F with five flats, instead of E to E on the white keys. An unknown form of music, however highly developed on its own lines, is naturally unintelligible to us until we have learned it. Music is a

language; and if anyone were to stand here and make a speech in an unknown language, Greek, for instance, it would be unintelligible to the majority of the audience. would not prove that the language is barbarous or nonsensical, but merely that the audience have not learned to understand and appreciate it. I think we are far too apt to consider that modern European music is the only possible form of this art, and to forget that music, like other languages, may take many forms. The music of one period is not the music of another, nor is the music of all parts of the world the same. Dr. Maclean has remarked, for example, that Indian music is undoubtedly a very highly cultivated art. There is no doubt that the Greeks did arrive at a high cultivation and development in musical art, that it was not the childish or barbarous art that some would have us believe; and its study is of importance to us because out of its remains grew, in the course of ages, our musical art. The connection between the two is very intimate, and I think it is not too much to say that if it had not been for Greek musicians we should scarcely have brought our music to its present stage of development. Mr. Southgate mentions the use of double flutes in other than religious functions in Egypt. My authority for my statement is M. Gevaert, who, by the way, is referring to Greek, not Egyptian usage; but I have not investigated the matter very far. It is, of course, quite possible that the Egyptians made use of combinations of sounds—the quotation from Varro I referred to shows that the Romans, at any rate, used two-part harmony on their double flutes. Mr. Southgate also referred to the powerful instruments and large bands used by the Egyptians. The Greeks disliked any very complicated musical effects. The number of singers in the tragic chorus was limited to fifteen, and I only yesterday came across a passage in Aristotle in which he asks, "Why does a Monody (song for single voice) give more pleasure when accompanied by a single lyre, or single flute, than when accompanied by a number of lyres or flutes?" The answer is that the melody and words are obscured by a number of instruments, and the composer's intention is not so easily grasped. Professor Campbell asked whether it is certain that the Greeks only sang their choruses in unison or octaves. I think the weight of testimony on this point is overwhelming.



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### ANCIENT GREEK MUSIC: A SURVEY

Now that a new edition of Grove's Dictionary has appeared and an Introductory Volume been added to the Oxford History of Music it should be possible for the student of music, who has no time or inclination to master the original authorities, to find out by consulting these standard works of reference the present state of our ignorance about Greek music. Whoever thinks so will be grievously disappointed. In Grove Dr. Macran's article has been reprinted without alteration from earlier editions. To the Oxford History a chapter on Greek music was contributed by the late Mr. Cecil Torr, whose much regretted death occurred before he had corrected the proofs. Between the two accounts there is hardly a point in common of any importance. would the main thesis of either writer be accepted by even a minority of scholars here or on the Continent. Is the situation then really so farcical? Is there no basis of fact to all the intolerable deal of theory? It is all the greater pity that such an impression is caused in that there has been a considerable revival of interest in the subject since the War. New fragments of some importance have been discovered and have been discussed by German, French and English An admirably concise handbook has been written by the late M. Th. Reinach. (1) In this country apart from Mr. Torr's chapter mentioned above, there have been articles by Prof. Mountford, (2) Mr. Clements, (3) Miss Schlesinger (4) and the present writer, (5) two thin booklets by Dr. Perrett. (6) Some of these contributions have been of very doubtful value, it is true; indeed perhaps the greatest light has been shed by one who is not a student of Greek music at all, as I hope to point out later. Fully to criticise these writings would need detailed argument which would be of little general musical interest. If what follows appears to be yet another theory about Greek music, my defence is that, while putting forward some hypotheses of my own,

<sup>(1)</sup> La Musique Grecque. Paris, 1926. Collection Payot.
(2) Journal of Hellenic Studies. Vol. 40. Classical Quarterly. Vol. 17.
(3) Journal of Hellenic Studies. Vol. 42.
(4) Musical Standard. Mar. 26, 1927, etc.; chapter on 'The Significance of the Control History of Musical Standard. Musical Instruments in the Evolution of Music' in Oxford History of Music

Introductory Volume.

(5) Classical Quarterly. Vol. 22.

(6) Some Questions of Musical Theory. Heffer. Chaps. I and II, 1926. Chaps. III and IV, 1928.

I have endeavoured to make it clear what is fact and what is theory, what is generally agreed and what is highly controversial.

How much do we actually know about Greek music? What can we reasonably conjecture? The bulk of our knowledge is about the theoretical systems of scales, which are described in the extant treatises; but it will be best to begin by enumerating some of the general characteristics of Greek music.

- (1) Harmony. Though Greek music was a highly developed art, our analogies to it must be drawn principally from folk music because of its mainly melodic character. How far a feeling for harmony went with them is a controversial point. We know they had no vocal polyphony, nor did harmony in our sense form part of the theory of Harmonikē. On the other hand the Greeks were certainly aware of both consonant and dissonant harmonic effects, and it is clear from some passages that at least consonant harmonies were used by accompanying instruments. Two of these passages actually suggest a second melodic part in counterpoint. However, the language is not clear and it remains doubtful whether this accompaniment amounted to more than the playing of an occasional note either with or after the note of the melody. None of the extant melodies show signs of a simultaneous accompaniment, though in some of them harmonic feeling seems to be shown in the melody; which is another matter.
- (2) Grace. A common characteristic of purely melodic music is a frequent use of grace to embellish the melodic outline and establish tonality. There is little evidence that the Greeks cared much for grace. Some simple figures were analysed by late theorists and an increase of this kind of thing may have marked the decadence of the end of the fifth century. But in the main the Greeks liked a simple straightforward type of melody. This no doubt was due to their desire to prevent the music from obscuring the sense of the words in any way. The same instinct made them desire clear vocalisation. Aristoxenus and others open their treatises with an insistence on the difference between the employment of sound by speech and song in this respect.
- (3) Melody and the Pitch Accent. The fact that they felt impelled to insist on that distinction is significant. There must have been a similarity to make them note the difference so carefully. The clue is given to us by the extant fragments. The spoken language had not a stress accent like ours but a pitch accent. Now it is noticeable that with few exceptions the Greek melodies we possess follow this pitch

accent according to some simple rules. (7) We are uncertain about the date of some of these melodies and so cannot be dogmatic about the history of this interesting relationship. But the Delphic Hymns (second century B.C.) follow these laws closely, the Hymns of Mesomedes (second century A.D.) break them fairly freely, which is only what would be expected seeing that the pitch accent began to give way early in the Christian era. The oldest of all the fragments, however, that from the Orestes of Euripides, breaks these laws, and Dionysius of Halicarnassus writing at the end of the first century B.C. quotes from the same score<sup>(8)</sup> to prove that they were not valid. This is probably to be explained by the fact that Euripides was an innovator. Perhaps he was here taking part in a movement to liberate music from the trammels of speech. We may, however, exaggerate the restriction that was in this way put upon the composer. modern song writer attends closely to the natural values of the words and these variations in pitch were part of the natural values of the Greek words.

(4) Rhythm. As the melody was to a slight extent dictated by the accents, so was the rhythm to a much greater extent by the quantities. It is difficult at first to believe that this was so, yet there can be no doubt that when words were set to music the rhythm of the music was based upon the rhythm of the words. Were this not made virtually certain by the language of the Greek theorists, it would be established in my opinion by the remarkable results obtained by the late Walter Headlam<sup>(9)</sup> and by Mr. George Thomson, whose book on Greek lyric metre has just been published. (10) The variety and complexity of the metres of Pindar and the Greek tragic poets of themselves made the apparently humiliating position of music more easily explicable. It has now been shown that these writers employed something that might be described, if we do not press the comparison too far, as a kind of rhythmical counterpoint, and also constructed their stanzas and complete odes upon principles of form analogous to those of modern music. Not only does this make it certain that the melody could not have had yet another rhythm which obscured that

<sup>(7) (</sup>a) In any word an unaccented syllable cannot carry a note higher than that carried by the accented syllable and tends to carry a lower one; (b) when a syllable bearing the circumflex accent has two notes (as is frequent) the second of them must be lower than the first. For a further 'law' governing the grave-accented syllables and a full discussion see Prof. J. F. Mountford in New Chapters in Greek Literature: Second Series (Oxford, 1929).

<sup>(8)</sup> The date ascribed to the papyrus is the first century A.D. This coincidence is curious, and it is by no means improbable that this was the only score of the fifth century or earlier that had survived to that date.

<sup>(9)</sup> Journal of Hellenic Studies. Vol. 22. 'Greek Lyric Metres.'

<sup>(10)</sup> Greek Lyric Metre. Cambridge, 1929.

of the poetry but it largely removes any desire on our part to have had it so, if the Greeks were such musicians even before they came to the melody at all. For a full exposition of these results the reader must be referred to Headlam's article and Mr. Thomson's book. (11) A few words must suffice here.

The elements of Greek rhythm were a number of short and characteristic phrases. These were by the great artists intricately combined and patterned by various methods of transition. It would need a number of quotations to show how sometimes the natural divisions of the words inside one rhythmical phrase will give a hint at another, a suggestion that will later be taken up and developed effectively, how one phrase will be made to overlap another, or how most subtly of all—two different rhythms will be made to run side by side in a kind of contrapuntal effect. Of this last device Mr. Thomson gives a fascinating example on p. 30 of his book from the Prometheus of Aeschylus (130-40). Here the repetition of a phrase of a common type (u - u - - u u - | u - u - - u u -) creates an anacreontic, as underlined, and this double rhythm produces an undulating effect admirably appropriate to the subject, the flight through the air of the Ocean Nymphs on their winged sea-horses. Some of these devices at once remind us of the way a modern symphonic composer develops his melodies. To the formal principles of construction to be found in stanza and ode reference has already been made. There is yet another musical analogy in the use of the phrase as leit-motif in association with persons or subjects. all these ways not only was an intricacy, challenging comparison with Hindu drum beating, given to the rhythm but a principle of coherence to the whole composition. We are told little or nothing of melodic form by the Greek writers and except for the second Delphic Hymn none of the fragments is both extensive and complete enough to illustrate its presence or absence. But this new approach to the subject has made Greek music intelligible to us in its form. The modern composer uses melody and harmony, the Greek composer used the element of pure time, but both to the same end and upon the same principles.

In its broader aspects we now know something about Greek rhythm. But we are far from being able to interpret it in detail. We can discuss phrases, but if we wish to discuss feet, let alone bars, we are in difficulties. Suppose we wish to write out an ode of Pindar in minims and crochets. Are we to assume that a long syllable is always worth two shorts? As it happens we know that in the time of Aristoxenus and later a long might be equal to three, four or even

<sup>(11)</sup> Also Prof. E. J. Dent's article on Headlam's theory in Journal of Hellenic Studies, vol. 23, where he discusses it from the musician's point of

five shorts. How far were such prolongations used by Pindar and Aeschylus? Or were they only brought into fashion by the theorists and innovators of the later fifth and the fourth centuries? Some scholars hold that, as Professor Mountford puts it, 'the quantities of the words may have been merely the skeleton of the living rhythm.' But if that were so, (12) what of the beauties newly discovered upon Headlam's hypotheses? Any considerable distortion would obliterate them entirely. Granted that the poetic rhythm ruled, did this itself need anything, beyond the approximate equivalence of a long to two shorts, to make it intelligible? This brings us to the difficult question of feet, bars, ictus, and arsis and thesis, or metrical rise and fall. If the phrase was the effective unit, was it nevertheless itself subdivided? Are we to use bar lines?

The bar line to us implies at least a slight ictus on the first of the bar. Though this is not absolutely incompatible with an unstressed language, there are reasons for believing that ictus in Greek rhythm was either non-existent or slighter than that in the music to which we are most accustomed. But even if the suggestion of the bar line is misleading, we demand a proportion in rhythm. clearly be a rise and fall, marked by a psychological if not a physical ictus. The Greek theorists demanded proportion too, and discussed the arsis (fall) and thesis (rise)(13) of the foot. (14) In the simpler metres, which consist of a succession of similar feet, no difficulty arises. The more complicated present two types of difficulty. (a) One concerns the proportion between foot and foot when different feet, dactyls, say, and trochees, are combined in a phrase. It used to be thought necessary to adopt some theory for obtaining equidistance of stress, as in most modern music. Now it is being realised that these diverse feet probably represent what we should call change of time signature, a phenomenon easy enough even in strongly stressed rhythm like the English folk song. Five-time was common, and the well-known dochmiac metre, which appears in many forms (u - u - u - u - u - etc.), is probably best explained as alter-

<sup>(12)</sup> Of the fragments that bear rhythmical signs only two show any considerable distortion of the verse rhythm; the Seikilos Epitaph, which is little more than doggerel, and the Berlin Pæan, which is an odd sort of poem, being written entirely in long syllables.

(13) 'Rise' and 'fall' for thesis and arsis, temps fort and temps faible are suggested by Prof. Sonnenschein ('What is Rhythm?') and seem the handiest English terms for the two parts of a rhythmical foot, despite the reversal of 'up' and 'down' involved in the change of metaphor.

(14) This proportion need not be mathematically exact. The voice is naturally flexible. Perhaps it would have been seemed processery for the

<sup>(14)</sup> This proportion need not be mathematically exact. The voice is naturally flexible. Perhaps it would have been scarcely necessary for the Greeks to consider the subdivision of the phrase but for the problem of choral singing. Dr. Dyson says (The New Music, pp. 25-33) of a later music that the bar line was a device of discipline. So it may have been the exigencies of conducting that led the Greeks to consider the foot and its divisions.

nating bars of three- and five-time. (b) Secondly, it often happens that in the complicated variations of a choral ode the regular rise and fall appears to be broken. Sometimes there appears to be an agglomeration of rhythmical rises; sometimes in the linking of phrases the same syllable seems to be arsis in one phrase and thesis in another. It is doubtful whether we shall ever have a final explanation of these difficulties; for we have no means of deciding how far the Greeks of Pindar's time were prepared to use prolongations and pauses to produce an equidistance of rises or at least a fairly regular succession of rises and falls. It is not very important.

(5) The Position of Music. We have seen that words gave Greek music its rhythm and to a lesser extent its melodic outline. would suggest that music was a purely ancillary art, whose sole duty it was to attend upon poetry as deftly and unobtrusively as possible. Yet against this we must put the high repute in which music was held by the Greeks, the regulations that the philosophers thought necessary to make for its control in their ideal states because of the effect on character they supposed the different modes to have. (15) Nor must it be supposed that there was no purely instrumental music. (16) No doubt choral lyric had the greatest prestige; but one of the oldest forms of Greek music was Auletikē (=αὐλητική), solo aulos playing. Its origins were associated with Asia, but early in the sixth century it was established at the Pythian games, and we know the names of many famous virtuoso auletes. Solo cithara playing came later. We see signs of a contest through Greek musical history, illustrated by a number of legends, between a conservative taste, loving a simple type of melody, which served the poetry and was particularly associated with the lyre, and a more elaborate, more emotional type of music, by origin Asiatic and associated with the flute. Of this contest we shall see more when we come to the modes.

In the later fifth century there seems to have been an important movement for the emancipation of music from poetry. The cithara became more elaborate and the composers of that day such as Phrynis and Timotheus were accused of spoiling the old dignified simplicity. As we have seen, there is reason to believe that Euripides revolted against the domination of melody by the pitch accent. There is also evidence for a corresponding revolution in rhythm. The resolved syllables in Euripides and his repetition of words as in a modern

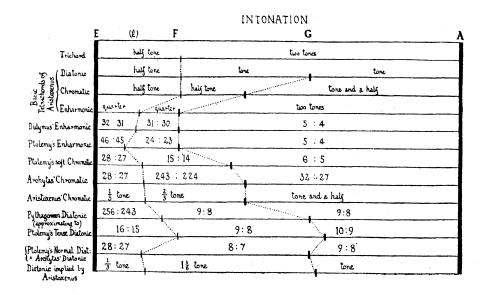
<sup>(15)</sup> See in particular: Plato Rep. 398d-400c, Aristotle Pol. viii. 1339b-1342b.

<sup>(16)</sup> The principal musical instruments of Greece were the lyre, the cithara (an elaborate form of lyre) and the aulos (a wind instrument, probably of the clarinet type).

anthem, the poor quality of Timotheus' extant poetry, which seems to be a mere congeries to fill up the rhythmical scheme, together with the parodies of Aristophanes and the complaints of critics all suggest that some change was going on. The general result seems to have been that the melody gained in importance at the expense of rhythm, which lost its old subtlety.

We cannot, of course, say whether this so-called decadence produced any first-rate music. There may have been too much self-conscious experiment, resulting in a sterility comparable to that of post-war Europe. There seems at any rate to have been in the music of this period an increase in an element of crude programme music that had not been known before. The music of Timotheus was accused of theatricality and may indeed have been as cheap as conservative critics made out.

Melody:Diatonic, Chromatic, Enharmonic. come to Greek melody, about which we have a great deal of information, though mostly of a barren character. Before passing to the scales we must make a preliminary survey of the type of intervals used in them. For in mainly non-harmonic music subtleties of intonation are likely to be of considerable importance, and several recent English writers have advanced theories about the intervals. In every case, while their main contention has been more or less justified, the associated theories of the modes have been open to grave objections. Thus we can agree with Mr. Clements that the Greeks employed septimal intervals and kept the major and minor tones distinct, but not that on the order of major and minor tones



were based three fundamental 'harmonies,' as he calls them. We can agree with Dr. Perrett that the Greeks appreciated the small intervals they used and that their quarter-tones were no glissando, while rejecting his fantastic doublet enharmonic scale. Mr. Torr's theory about the intonation was based entirely on a false assumption about the keys and the nature of the notation. His eighth-tones had no existence except in his imagination. (17)

To return to the ancients, we may first put away from us any idea that they knew a tempered scale. It is true that the language of Aristoxenus suggests temperament, as for him six tones made an octave, two semitones a tone. However, this must have been merely an unscientific simplification for the sake of convenience. We must find the true meaning of his quarter-tones, third-tones, etc., from other sources. Fortunately the computations expressed in ratios of a number of Pythagorean mathematicians from Archytas (fourth century B.C.) to Ptolemy (second century A.D.) have been preserved by the latter. The Greeks described intervals by means of a typical tetrachord (say E F G A in the diatonic), in which the extreme notes stood firm, the two between moved within certain loci to give the variations of the genera (see Table I). Of these there were three: diatonic, chromatic and enharmonic, which can roughly be represented by the Aristoxenean successions: diatonic  $\frac{1}{2}$ , 1, 1, chromatic  $\frac{1}{2}$ ,  $\frac{1}{2}$ ,  $1\frac{1}{2}$ , enharmonic  $\frac{1}{4}$ ,  $\frac{1}{4}$ , 2. Of these the enharmonic would seem queerest to the modern ear, but its actual existence is undoubted and it attained a wide popularity. The thing that is most certain about it is the size of the interval F-A, the major third (5/4). The three lower notes were quite possibly obtained from a single hole of the aulos. How this semitone was divided, whether in fact the two small intervals were not regarded as virtually equal, on this the mathematically minded may speculate with little check. Aristoxenus regarded them as equal; but the heyday of the enharmonic was over even in the fourth century, and when Ptolemy divided it  $\frac{46}{45} \times \frac{94}{23}$  he did it for a mathematical consideration only; probably the ratios of Didymus  $(\frac{3}{31} \times \frac{3}{30})$  more nearly represent the facts. The *chromatic* had for its upper interval the minor third (6/5). It is uncertain what exact intonation Aristoxenus' equal semitones

<sup>(17)</sup> This is not the place to discuss Miss Schlesinger's view (Oxford History, Introductory Volume, pp. 86-9) of the importance in ancient music of a kind of natural polyphony caused by the interplay of harmonic overtones. If in her forthcoming book she succeeds in relating the modes to the higher partials, doubtless there will be more to be said. As it is, if this sensitiveness was in fact more than an appreciation of timbre, has this mechanical polyphony any more to do with music as a language for the expression of human emotion than bird-song or an Aeolian harp? And it is music as a language that we want to discover among the Greeks, not merely their sensuous pleasure in sound.

represent or whether the minor tone was ever divided approximately However, on p. 52 (Meibom) he implies the sequence  $\frac{1}{3} + \frac{2}{3} + 1\frac{1}{3}$ ; the chromatic of Archytas is  $\frac{28}{27} \times \frac{243}{24} \times \frac{32}{27}$ , the soft chromatic of Ptolemy is  $\frac{28}{27} \times \frac{15}{14} \times \frac{6}{5}$  (the two differ only in the disposition of a comma). So that it seems there was a variety of chromatic in which the middle interval was about double the lowest. In the diatonic the Pythagoreans used for their calculations a tetrachord with two major tones, and Ptolemy tells us that in his day this was actually undistinguished from the modern just intonation  $\frac{16}{15} \times \frac{9}{8} \times \frac{10}{9}$ ; either may have been the standard diatonic of Aristoxenus. Ptolemy, however, regards as most normal the tuning  $\frac{28}{17} \times \frac{8}{7} \times \frac{8}{8}$ . These septimal intervals are also given by Archytas and implied by Aristoxenus  $(\frac{1}{3} + 1\frac{1}{6} + 1, p. 27)$ . We shall not be far wrong in saying that the diatonic tetrachord consisted of two tones of variable size and a residual semitone, that the middle interval was normally the largest and frequently the septimal tone (8/7).

There are a number of other variations which have not been mentioned. We can only place reliance on those which are mutually supported, and it is remarkable the way that Archytas, Aristoxenus and Ptolemy confirm one another. Further hypotheses must be of an a priori nature. No doubt subtlety of ear varied from period to period and among the musicians of any one period.

We can now turn to the modes.

The Modes. In dealing with the modes we must begin with the system of Aristoxenus, but we must not stop there, as too many have done. It is now becoming recognised that this portentous scheme, tidy in all its parts, is too tidy by half; and, though our views of the early Greek modes must be in part determined by deductions from it, there is enough other evidence to guide us roughly along the right lines.

The system of Aristoxenus, which we know partly from his own writings and partly from those of his followers, is a vast inventory of the melodic resources of Greek music. It consists of thirteen keys, in pitch a semitone from one another (two more were added later). Each key (róvos) was a scale two octaves in length, in its diatonic form as from A—a on the white notes of the piano. This could be analysed in two different ways. Most fundamental to Aristoxenus' system was the division into tetrachords. The core was the octave e—e, consisting of two tetrachords of the shape already described joined by the disjunctive tone—e—a—b—e . e—a above, B—e

<sup>(18)</sup> This and the chromatic above do not appear in his fallaciously symmetrical scheme of nuances. It is all the more significant that he should admit the validity of these intonations in an incidental fashion.

and a further tone below completed the double octave. In addition there was a supplementary tetrachord a—d, introducing the note both and in effect producing a modulation. The whole was known as the Greater Perfect System. Each of these tetrachords (whose names appear on Table II, p. 337) could assume diatonic, chromatic or enharmonic forms. Notice the framework of 'standing notes' (A B e a b [d] e a).

Secondly, this two octave scale contained in itself the seven 'species of the octave '  $(\epsilon \tilde{\iota} \delta \eta \ \tau o \hat{\iota} \ \delta \iota \hat{\lambda} \ \pi a \sigma \hat{\omega} \nu)$ , which in the diatonic were the A mode, B mode, C mode, etc.

Where in this great edifice were the modes, the approvation in which Alcman, Pindar and Sophocles wrote, of which Plato and Aristotle speak? The old modes had names derived from the tribes of Greece and Asia, Dorians, Lydians, Aeolians and the rest. These names or modified forms of them belong in Aristoxenus' system to the keys. But they are also given as obsolete names for the octave species (see Table II). Were either of these the old modes? Monro and Torr held that the apportal were the keys; for Monro they differed only in pitch, for Torr they differed subtly in their intervals. There are weighty reasons for rejecting this view. Were they the octave species? This is the view held by Westphal, Gevaert and Reinach and in a modified fashion by Laloy and Mountford? On this theory the modes were true modes with distinctive characters of their own, and they have a clear relation to the tones of the Roman Church. Within limits this view is right. But perhaps it would be truer to say that the species of the octave are the sole representatives in the system of Aristoxenus of the old modes. Aristoxenus came at the end of more than a century of theoretical standardisation. There is evidence both internal and external that some of the realities of music had been squeezed out. There is the factitious nature of some of his scales: for instance, the enharmonic Lydic (B c e e f a b b)(20) bounded by Again, while keeping the genera separate, he its quarter-tones. admits that the 'mixture of genera' needs studying. Externally, we can expose him from the extant fragments, since the 'Orestes' papyrus, the two Delphic Hymns, a piece in the Berlin papyrus, and perhaps the Hymn to the Muse contain notes which are out of place in their scales on the Aristoxenean analysis. Most important of all, however, are the old scales preserved by Aristides Quintilianus.

<sup>(19)</sup> The interplay of this tetrachord with the tetrachord diezeugmenon (see Table) is well illustrated in the Delphic Hymns.

<sup>(20)</sup> The adjectival forms of Doric, Lydic, Mixolydic, etc., are here adopted, although they are not those used for the modes by the Greeks, because this is likely to be less confusing to those who are accustomed to the nomenclature of the Church modes and whose Dorian is, therefore, a D mode, Mixolydian a G mode, etc. A dot over a note, e.g., B, indicates that it is raised by a quarter of a tone.—[Ed.]

These are of priceless value to us. For from them, from accounts of the old Spondeion scale given by Plutarch, from a few traditions and from assumptions as to what must have been to produce the system of Aristoxenus we must deduce what is possible about the early music of Greece.

The history of Greek music is that of two confluent streams, the Hellenic and the Asiatic. The two fought for the mastery and in theory at least the victory went to the Hellenic. To this stream we can ascribe the all important tetrachord with its smallest interval lowest and also in all probability the diatonic genus; for in one of the few glimpses we are given of the folk music of Greece we hear of Aetolians using the diatonic. Indeed a diatonic tetrachord may well have been the most primitive thing in Greek music, in which case it would find an interesting parallel in the Saman chant. (21) More developed forms of which we can be fairly certain are the heptachord of firm tradition (e f g a bb c d), which left its mark in the supplementary tetrachord of the Greater Perfect System, and the octave e-e, the undoubted Doric mode in its diatonic form and, as we have seen, the very kernel of Aristoxenus' system. With the attainment of this octave tradition associates the name of Terpander (seventh century). Perhaps also the addition of a tone below the heptachord may have given the Aeolic from d-d, though the early form of this mode is more doubtful.

Asiatic influence is symbolised by references to a legendary musician, Olympus. With him are associated the Phrygic and the Lydic, which latter he is said to have invented, and—in close and important connection—the Spondeion scale and the origin of the enharmonic genus. Of the Spondeion we can trace the following history from accounts in Plutarch and hints in the Aristotelian Problems. (22) First, the pure Spondeion, a scale of the form e f a b c, in which the small intervals were three-quarter-tones (12/11). It developed in various ways; the lowest interval, whether then semitone or still three-quarter-tone, was divided into two small intervals; later the upper semitone was divided also; before or after this the octave e was added. Note the result obtained: e e f a b b c e.

Here follows a list of the scales of Aristides. With them and the scales already mentioned and the octave species of the theorists in the three genera we shall have all the cards upon the table.

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Doric: deefabbce [Syntono] lydic: eefac Mixolydic: BBcdeefb
Phrygic: deefabbcd Ionic: eefacd [(Hypo) lydic: efabbcee] (23)
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<sup>(21)</sup> A. H. Fox Strangways' Music of Hindustan, p. 277.
(22) This question is treated in detail in my article 'The Spondeion Scale,' to which reference has already been made.
(23) This scale is bracketed as probably spurious.

## SCALES AND MODES

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etc, etc.																				

These were, says Aristides, the modes to which Plato refers, and there is little reason to doubt that they are examples of the pre-Aristoxenean modes. We may notice several points.

- (1) The compass of the Syntonolydic is the same as that of the Spondeion and both are associated with Olympus. These scales have little yet in common with the formalised octaves of later days.
- (2) We are told that the semitone was not divided in the early Spondeion, that it was first divided in the Phrygic and Lydic. Whatever the history, we may take it that this type of scale, in which an interval of the major third had below it two small intervals

completing the fourth, was characteristic of the Asiatic contribution to Greek music.

- (3) We are expressly told that Doric melodies of the primitive Spondeiac type (we shall see that in retrospect the Spondeion became Doric) did not employ the note d below this tetrachord. The scales of Aristides show us why this piece of information was necessary. In Doric, Phrygic and Mixolydic scales this 'diatonic' note appears below the 'enharmonic' tetrachord. Reference to the Orestes fragment and to the second Delphic Hymn shows us that not only in the fifth but even in the second century B.C. this mixture of genera was an element in Greek music.
- (4) Aristides unfortunately gives only those modes which Plato mentions. This accounts for the omissions and for the name Syntonolydic. This is the same as the primordial Lydic of Olympus, which with the Doric and Phrygic is by tradition oldest of all. There was another and later Lydic, the 'low' or 'slack' Lydic of Plato. Similarly there were in all probability two Ionics, one the 'slack' Ionic of Aristides, another which eventually developed into the Hypophrygic species, though some would deny this. The Aeolic unfortunately does not appear in the list and it is not clear whether we should account for it as above. Both the 'slack' Lydic and the Mixolydic were regarded as having been invented about the turn of the seventh and sixth centuries. The latter must have got its name from a mixture of Doric and Lydic characteristics.

On the one side, Hellenic music, with a fixed structure of tetrachords and probably diatonic. On the other, modes of diverse form with an enharmonic element and not directly comparable with the Hellenic Doric. Two questions arise. How far was the one subordinated to the other? And how? To the first we can answer: In theory, completely; in practice, who knows? To answer the second we can put forward a number of conjectures. Here is a curious phenomenon to be accounted for and these ideas are advanced quite tentatively in the hope that they will partly do so. Of course, broadly speaking, if the modal dialects of Asia were drilled into an Hellenic shape, it was because of a natural tendency of the Greek to prefer a certain form of musical expression. This is the fundamental musical reason. But we can suggest contributory causes.

(1) The Spondeion scale is associated with Olympus, but of all those in the Asiatic tradition it is most easily comparable to the Hellenic strain. Not only in form does it fit the lower part of the diatonic Doric, but it was associated apparently with a sober and dignified style that gained it great prestige. When the semitones were divided and the upper E added, it was in form the enharmonic Doric of the Aristoxeneans. Thus the Spondeion acted as a link.

- (2) At what point this developed Spondeion could have been regarded as an enharmonic Doric is not clear. Compare the lower half of the Lydic of Aristides with a diatonic tetrachord. It is clear that the g is missing and the e—f interval made into two. But when the chromatic had come into use (very possibly at first it was an attempt to imitate the enharmonic intervals on stringed instruments) another way of regarding the matter sprang up. e è f a, e f f a, e f g a, are all comparable tetrachords; the third note varies in the locus f—g; e and a are standing notes; a fetter has been forged to clamp the Asiatic modes to the Hellenic framework. From this point the Doric could adopt the enharmonic form practically provided for it in the developed Spondeion; similarly, we can postulate a diatonic Lydic or Phrygic.
- (3) To the pleasure found in the Doric mode in practice a theoretical prestige was added by the mathematical doctrines of Pythagoras. By showing that the formula 6—8—9—12 gave the notes e—a—b—e he evidently impressed the Greek mind greatly and helped to fix the Doric octave—two tetrachords joined by the disjunctive tone—in the centre of Greek musical theory.
- (4) There is reason to believe that as musical instruments developed they became capable of rendering combinations of modes. This was effected by the addition of holes and devices to the aulos and of strings to the cithara. In this way the idea of a continuous inclusive scale was fostered.

The actual details of the process are quite obscure. Clearly the Phrygic was seen to fit into place below the Doric. The Syntonolydic of Aristides by the addition of the lower c would come below that; the Mixolydic fitted into the B octave. At some point in the process B—e would be thought of as a new tetrachord (hypatōn). In the other direction it was the old 'slack' Lydic that became the F octave (Hypolydic), the lost 'tense' Ionic that became the G octave (Hypophrygic); the A octave (Hypodoric) was the developed form of the Aeolic; e—a became the tetrachord 'netōn.' The historical order of this process is quite unknown and whether there were long stopping-places on the way. Nor can we say what combinations were practical and what theoretical or how far a sorting out of the genera accompanied it. However, some such development must have gone on, until the labours of numerous fifth and fourth century theorists culminated in the system of Aristoxenus.

The keys came into being as pure pitch keys and got their names from that species of the octave that they brought into the middle range of the voice. Their very existence implies a standardisation of mode. How far was this standardisation effective in practical music?

before we can attempt to judge this issue, three tasks await us, to examine the conception of Ethos, to consider the evidence about tonality, and to review the surviving remains of Greek melody.

A large amount of the interest taken in Greek music is undoubtedly due to the well-known pronouncements philosophers about its moral value. It is a curious idea to us that a musical mode could affect the character. To judge by the music of other nations it is even curious that a specific character ( $\hat{\eta}\theta$ os in Greek, as 'character' in English, has this double sense) should be associated with a mode or scale rather than with a complete style. But there are many things to modify the impression we get from Plato and Aristotle. (24) This ethical view of music was put forward by Damon, an important figure of the middle of the fifth century, from whom it was adopted by Plato; but it was not allowed to pass without protest even among the ancients. These contentions are vigorously opposed by an anonymous probably of the fourth century B.C., and by Philodemus of Gadara in the first. More important still is the attitude of the musicians to this doctrine of the philosophers. Aristoxenus, as the pupil of Aristotle, did not like to deny it outright, but he qualifies the statement that music may hurt or improve character with the significant addition 'in so far as musical art can improve moral character'; and, when we come to his own discussion of 'ethos,' we find that it is a matter not of the absolute moral value of certain modes but of the appropriateness of a combination of mode, genus and rhythm to the treatment of a given subject. (25) Again, his followers do not classify modes, they classify styles. (26) Allowing for a large conventional element, which assigned certain modes to certain subjects, as convention dealt also with rhythms upon Headlam's and Thomson's theory, there were a number of subsidiary associations, which led to this view of the modes: a characteristic and simple style associated with the Doric; the association of the Phrygic with the low-pitched Asiatic aulos, to whose exciting effect there is testimony;

<sup>(24)</sup> Aristotle may have been a musician but Plato's knowledge was probably limited to the mathematics of the subject. There is a revealing passage in the Laws (699 D-E), in which he admits that without the words he cannot understand what the rhythms and modes mean!

<sup>(25)</sup> Aristox. Harm., p. 31, and ap. Plutarch. de Mus. §357, etc. (ed. Weil and Reinach).

<sup>(26)</sup> It is true that Ptolemy uses language to suggest that ethos depended upon the succession of notes, but it is vague language and he appears to be searching after a description of modality that is beyond his vocabulary.

the association of the Syntonolydic with a high pitch<sup>(27)</sup> suitable to lamentation. We may doubt if it was ever purely the succession of notes in the scale that determined the ethos. As for the morals of music, that we can leave to the philosophers—which is no doubt what the Greek musicians did.

Tonality. We could discuss the justice of associating emotional characters with modes better if we knew what was their tonality and their characteristic melodic idiom. Clearly it is little use to know the succession of notes in a scale, unless we also know something of its internal hierarchy. We may guess that in the Mixolydic of Aristides conjunct movement among the close packed lower notes was varied with leaps to the upper b, or that the Syntonolydic melody was based on the fifth, f—c. But there are only two things that could have given us definite information—a clear statement in ancient theory or a large collection of reliable remains. Neither of these do we possess.

There is no theory of tonality. There are only a few passages, notably two in the Aristotelian Problems (probably third century B.C.), which attribute a kind of tonal importance to the note 'Mesē.' Mesē is the note a in the middle of the Greater Perfect System according to the nomenclature most commonly used, but there was also another that made it the note fourth from the bottom in any of the octave Westphal once held but later abandoned the view that Mesē in the latter sense was tonic in all the modes; Gevaert held a modified form of it. But it is in fact clear that the writers were using the other nomenclature throughout their work. Dr. Macran put forward the perfectly plausible suggestion that in all the modes the same note (a) of the Perfect System was tonic and that their characteristic effects came from its position high or low in the modal octave. This, however, is not in the least borne out by the surviving fragments. It might seem arbitrary to limit the application of these pronouncements to the Doric and leave the question of the other modes open. It becomes less so when we notice that the actual language of Prob. xix 20 refers to the frequent use of the Mesē in 'all good melodies' and remember that the Doric was the only mode to which Aristotle gave full approval. What if the pupil has elevated the master's praise into a general principle of tonality? is certain that the note a was tonic in the Doric E mode.

<sup>(27)</sup> Whether the old modes differed importantly in pitch is difficult to determine. The Syntonolydic is by tradition high, the Phrygic on its native instrument was low, the Doric very probably of medium pitch. But the Greeks must have been prepared to abandon these distinctions, if, as they apparently did, they played the different modes on the same lyre retuned.

Fragments. In passing to the fragments I should like to call attention to Prof. Mountford's scholarly editing of the latest discoveries in New Chapters in Greek Literature. This is now one of the most attractive and accessible editions, and, although a few of his interpretations may be questioned, the scholarship that has produced the transcriptions is absolutely reliable. (28)

I shall tabulate these fragments and state very briefly the contribution each makes to our knowledge.

The Orestes Fragment. Almost certainly this is part of a Euripidean score, but it is very brief and badly mutilated. It is impossible to dogmatise about its mode or tonality. Its importance lies in the fact that it is one of the old modes. Its succession of intervals  $(1 \ \frac{1}{4} \ \frac{1}{4} \ 2 \ 1 \ \frac{1}{4})$  forms part of both the Doric and Phrygic of Aristides.

First Delphic Hymn. The date is probably late second century B.C. (a) The first section of some 30 bars is interesting as showing that the style of the old Spondeion still survived, with its trichords instead of tetrachords. Despite a few gaps, we can appreciate this as a well turned interesting melody. Transcribed in three flats the tonic is clearly c. Doubtless this is the Doric mode; the cadence on g may be regular. (b) The second section introduces a note alien to the Aristoxenean key in which it is written. By this means a succession of three semitones is produced. This chromatic effect is used to describe the rich savour of sacrifice and the music of pipe and lyrece may still be the tonic, though the section ends on b\mathbb{\

Second Delphic Hymn. The date is 128-7 B.C. There are changes of key and style forming a pattern A B C B C B A. This gives a musical form to compensate for the monotony of the rhythm. Style A is pure Spondeion except that the second piece uses and the first may use (neither are complete) the note below the old Spondeion (g in one flat), which we saw to be characteristic of the old modes. Also, the tetrachord synemmenon is used for contrast, but still 'trichordally.' d is tonic and the cadences are on a. Style C is based on the old heptachord; the lower tetrachord is here chromatic; below it appears the diatonic g. There seems to have been a tendency to employ chromatic or enharmonic in the lower tetrachord only, witness the history of the Spondeion and a remark of Ptolemy's. The

<sup>(28)</sup> Mountford gives in musical score the Orestes fragment, the Aidin Inscription (or Epitaph of Seikilos), the Berlin fragments and the Christian Hymn. Von Jan (Musici Scriptores Graeci. Supplement. Teubner.) gives all the fragments but the last two. Reinach's La Musique Grecque has them all and except for a few details is quite reliable. The Delphic Hymns may be found also in Collectanea Alexandrina, ed. J. U. Powell (Oxford).

subject in either case is appropriate to the Greek idea of the chromatic. The two final cadences are lost. Style B is characterised by leaps of an octave from e to e (natural key) and by melodic figures (e.g., defe) emphasising e. It is similar in this respect to the mutilated end of the First Hymn. e appears to be tonic. In general we may say that in these Hymns, while it is very difficult to ascribe modes, or species of the octave, the tetrachordal structure of 'standing notes' is always clear. Is this typical Dorized Aristoxenean music (barring the anomalies noted)?

The Epitaph of Seikilos. An inscription of uncertain date. Its four lines are complete and the rhythmical interpretation fairly clear. The scale employed is the diatonic octave from e to e (in two sharps). The tonic seems to be a; the cadence is a f# e. This piece is the chief argument for those who hold that the species of the octave were the real basis of Greek music. For them this is Phrygic (the D mode) with its tonic in the same relative position as that of the Doric.

The Hymn to the Muse. The date is uncertain; also whether this is two pieces or one. In any case the style is homogeneous. Barring one note of doubtful interpretation, which may introduce an anomalous chromatic, the melody is diatonic and lies mainly between e and e (in one flat: i.e., the (Mixolydic) B mode). a appears to be tonic.

The Hymns of Mesomedes. Second century A.D. These are somewhat dull and formless melodies. The Hymn to the Sun has a diatonic compass g to f (in one flat); the notes of melodic importance appear to be a and e, of which the former is probably tonic. The Hymn to Nemesis is written in the diatonic octave g to g (D species), plus the note f, and as c is apparently tonic it recalls the Phrygic modality of the Seikilos Epitaph.

The Berlin Fragments. This papyrus contains fragments, vocal and instrumental, of what appears to have been an anthology of The pieces were composed at uncertain dates, probably melodies. before the third century A.D. (A), which is part of a Pæan, and (B), which is instrumental, are purely diatonic. They are so badly cut up that the ascription of tonic and mode is too risky. There is no sign of tetrachordal structure as in the Delphic Hymns. They appear more similar to the Epitaph and the Hymn to Nemesis. be a fragment from some tragic lament. The mode is obscure, but the surviving scale is interesting (b c# d e# f#), as it can be compared with the Byzantine chromatic. (D) is so hard to interpret rhythmically that one cannot venture to discuss tonality.

The Christian Hymn (not later than the third century A.D.) is

diatonic and written in the g—g octave (Hypophrygic) plus the note f. c appears to be tonic.

We can now take stock of the position. Our earliest fragment shows Euripides using one of the old apporta, but which and how we cannot say. The Delphic Hymns illustrate the simple style of the old Spondeion and the theoretical analysis of Aristoxenus. Apart from these and portion (C) of the Berlin Papyrus we have a number of diatonic melodies, sometimes within and sometimes over the compass of an octave. The tonic is fairly clear in a number of cases, and we get a distinct suggestion that the Phrygic (D), Hypophrygic (G) and Mixolydic (B) diatonic octaves had their tonics fourth from the bottom like the Doric. What is their relation (1) to the old modes; (2) to the system of Aristoxenus; and (3) to the system of Ptolemy and the early Church music?

- (1) Because we find in the Seikilos Epitaph a Phrygic d species with a tonic g, can we take it that this was of the essence of the wild Phrygic of Euripides' choruses? The indications are against it. The Phrygic of Aristides does not in fact possess this note g at all. This Phrygic octave species is used in a graceful epitaph, a highly conventional hymn and possibly in a Pæan! The Mixolydic species is employed as no mode of lamentation.
- (2) We have asked how far the system of Aristoxenus really meant a standardisation of mode; and we have seen that the Delphic Hymns, while containing anomalous elements, on the whole might have been written to illustrate his works. Further, the very existence of his keys implies this standardisation. Ptolemy, writing in the second century A.D., quarrelled with the Aristoxeneans for using this word (τόνος)—and the old modal names—for pure pitch keys. His own τόνοι were in effect the seven species of the octave extended into the seven species of the double-octave. But the octave species were in the system of Aristoxenus also. Where was the centre of gravity? Did these octave species, if they were practical music, look forward or backward in their tonality? How can we apply the same principles of tonality to his enharmonic as to his diatonic octaves?
- (3) This brings us to an important fact in the history of Greek music. The scales of Aristides represent the height of the enharmonic period. This genus had lost favour by the time of Aristoxenus, but the chromatic was still popular. By the time of Ptolemy the diatonic was supreme; for the only variety of chromatic he recognises is little more than a kind of diatonic, and was so thought of by Aristoxenus. We have seen that it was in the nature of the enharmonic and

chromatic to emphasise a certain shape or framework of scale. With their disappearance there became possible for the first time in practical music a neat system of octave modes, complete with tonics and perhaps finals, and comparable to the modes of the Roman Church. Perhaps it may ultimately prove more profitable to discuss the surviving melodies of the Greco-Roman period with reference to the future rather than to look to those melodies to throw light on the music of Pindar and Sophocles.

Everywhere we are faced with unanswered questions. It is an unsatisfactory state of affairs, and the reader will naturally want to know what hope there is that it will be improved. The scholar wishes primarily to interpret the writings of the ancients. He may reasonably expect by careful study to eliminate apparent contradictions and form hypotheses which will give an intelligible history of Greek musical theory. The secondary concern of the scholar and the only desire of the musician is to understand Greek music as an art. But this would need a large number of actual melodies of all periods, unmutilated and definitely dated. Further fragments are likely to turn up, but there is little hope that they will be in better preservation than those we possess or that they will date back to that early period about which we are naturally most curious.

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Greek Music

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#### GREEK MUSIC.

The general conviction that the true nature of ancient Greek music is practically incomprehensible in modern times arises from many causes, of which the most potent are:—

- 1. That hitherto all explanations have been based on the extant formal treatises, which deal either with the decadent elaborations of solo citharaplaying, or the purely theoretical calculations of the self-styled Pythagorean school, which latter professedly despised the actual performance of music.
- 2. The attempts to elucidate the subject make no allowance for the fact that the extant specimens of noted music extend over a period of at least eight centuries, and no one explanation is likely to fit either the whole of these or the casual references to music to be found in general Greek literature.
- 3. Thanks mainly to Aristoxenus, the modern mind has become so permeated by the quarter-tone theory of the enharmonic genus, that even so simple a record as the celebrated Euripides fragment has been generally interpreted as involving this minute interval. The arguments against this theory, at least as regards vocal music, are weighty and almost conclusive; but their full development requires more space than is available here.

This article is an attempt to summarise the main conclusions arrived at from a careful consideration of authenticated history, the representations of musical instruments, the complete notation, and the casual references to music of various Greek writers, especially Plato, Aristotle, and Plutarch. It is manifestly impossible to give the authority for each statement, but a few of the more important references will be given.

It seems most profitable to begin with a brief chronological survey of the subject. The first solid ground from which we can start is the existence of the Sacred Enharmonic Conjunct Scale, represented in our nomenclature (in ascending order) by the letters

## E F F# A Bb B# D.

The main reasons for certainty on this point are the universal tradition that the enharmonic was older than the diatonic, the fact that these notes are

menon), and the scale consists of seven notes only; if the upper tetrachord is separated from the lower by the interval of a tone, the system is called Disjunct (diezeugmenon) and the scale comprises an octave.

<sup>&</sup>lt;sup>1</sup> Greek scales are built up of two groups of four notes, called tetrachords, contained within the limits of a Fourth. When the upper tetrachord and the lower have one note in common the system is called Conjunct (synem-

represented without variation in the fifteen varieties of notation usually known as modes, and the consideration that the approximate date of the introduction of the octave system is well known.

Indeed, without any appeal to history or notation, a very strong initial probability in favour of its superior antiquity appears in the construction of the scale itself. It is well known that the Greeks determined their intervals by the notes given by different lengths of string cut off from a Kanon (or monochord). This apparatus consisted (see Claudius Ptolemaeus, I. 8, p. 18, Wallis, with diagram) of a single stretched string, with a fixed stopping-point in the middle called the magas, and a movable boss, called the hypagogeus (Scholium in marg. MS. Harmonicorum Ptolemaei Bibl. Reg., l. i, c. 8) 'which is used in the canon for various ratios, so that whatever parts are desired may be cut off from the string to produce the corresponding sound.' If then the string were so stretched that the magas gave the highest note of either of the Sacred Enharmonic tetrachords, the other three notes would be obtained by adding to this length by means of the shifting hypagogeus its third, fourth, and fifth parts respectively. It may be asked why the simplest fraction, i.e. the half, was omitted. The answer is that such an addition would have produced the fifth below the starting-tone; and, strange as it may seem to the non-musical reader, it is absolutely impossible to form any system based upon the fifth as an interval in which all the fifths shall be perfect,<sup>2</sup> and also the thirds.

The next development in Greek music was the introduction of the Diatonic Genus, probably borrowed from Asiatic or Egyptian sources: at any rate, the most ancient of the Hebrew melodies used in the synagogues at the present day show a very strong diatonic feeling, and their inspiration must have been either Asiatic or Egyptian.

The Diatonic Tetrachord retained the method of obtaining the two lowest notes by adding a third and a fourth respectively to the length of string required for the highest note, but the awkward gap between this latter and the next lower one was diminished by the device of cutting off one-sixth from the length of string needed for the lowest note. Thus we get the Dorian Diatonic Conjunct Scale, in our notation:—

In addition to the intrinsic historical importance of this scale, there are two points in connexion with it of extreme interest as exemplifying the passion of the Greek mind for the conservation of a perfect form of art when another nation would have discarded it in favour of a newer and more complex form. After the introduction of the octave scale, the seven strings of the chelys continued to be tuned to this scale certainly up to the time of Plato, and probably of Aristotle; and the retention of the letters for it in the

<sup>&</sup>lt;sup>2</sup> Our modern justly intoned scale is represented by the vibration numbers

C D E F G A B C 24 27 30 32 36 40 45 48

and the fifth from D to A is represented by the ratio  $\frac{40}{27}$ , which differs from the true ratio by a 'Comma'  $(\frac{81}{80})$ .

notation served and still serves as the absolute measure of the pitch of the latest development of Greek scales. These points, however, must be deferred for later explanation. If anyone should doubt the efficiency of such a scale for musical expression, it may be pointed out that the melody of our National Anthem is strictly confined within its limits.

The latter half of the seventh century B.C. marks a crucial epoch in the history of Greek music—the introduction of the Octave System. This period covers the fall of the Phrygian kingdom, the official recognition of fluteplaying by Sparta, and the life and work of Terpander. It is suggested that the fall of Phrygia may have played a part in the history of Greek music similar to the influence on Western learning and literature of the sack of Constantinople in the Middle Ages. At any rate, internal evidence of the Greek instrumental notation proves that the Phrygian was the oldest instrumental notation, and was based upon the octave principle. Leaving the region of surmise and conjecture, and returning to authenticated history, it is beyond doubt that Terpander during this period adapted the Octave System to the kithara. The seemingly contradictory statements about this great man have caused some to doubt his existence, but, if time and space permitted, it could be shown that statements which appear to be categorical denials of one another have each their foundation in fact when rightly interpreted. Suffice it to say here that the so-called 'Defective Scale of Terpander,' which was really a tuning of the strings of the kithara, was

#### E F G A B D E.

And now it is necessary to say a few words about the characteristics of the two typical forms of Greek lyre—the chelys and the kithara.

The chelys was a slightly built instrument, having at this stage seven strings and a tortoise-shell body; not provided with any means of modifying the pitch of any string during performance. It was the instrument of domestic and private art.

The kithara was of very solid construction, furnished with a capacious sounding-box, and at this stage provided with seven strings, and stops which allowed the original note of each string to be raised a semitone by the pressure of the left forefinger. The principle of this semitone stopping is now generally conceded; but in case any doubter should remain, he ought to be convinced by the following passage from Plato (*Philebus*, 56):—

καὶ ξύμπασα αὖ ψαλτική, τὸ μέτρον ἑκάστης χορδῆς τῷ στοχάζεσθαι φερομένης θηρεύουσα, ὥστε πολὺ μεμιγμένον ἔχειν τὸ μὴ σαφές, σμικρὸν δὲ τὸ βέβαιον. [In all lyre-playing the pitch of each note is hunted for and guessed; so that it is mixed up with much that is uncertain, and contains little that is steady.]

The kithara was pre-eminently the professional instrument. Not only was it used in all public performances, but the kitharist was the teacher of all music, including the chelys.

The possibilities of Terpander's tuning can at once be seen by the

following table, in which stopped notes are shown by italic small letters. The kithara could thus play these scales:—

Enharmonic Conjunct	$\mathbf{E}$	$\mathbf{F}$	$f \sharp$	$\mathbf{A}$	$b\mathfrak{b}$	$\mathbf{B}$	D.	
Diatonic Conjunct	E	$\mathbf{F}$	$\mathbf{G}$	$\mathbf{A}$	bb	c	D.	
Diatonic Disjunct	$\mathbf{E}$	$\mathbf{F}$	$\mathbf{G}$	$\mathbf{A}$	В	c	$\mathbf{D}$	E.

The relation to the Octave System of the seven-stringed chelys, unprovided with any mechanism for semitone-stopping, demands consideration, though it seems so far either to have escaped or evaded attention. How could a seven-stringed instrument play an eight-note scale? The answer would appear to be that the upper octave of the lowest note was 'magadised,' *i.e.* played as a harmonic, on the lowest string.

The evidence for such a statement and all that it implies is necessarily indirect, as both Aristoxenus and Plutarch complain, the former that the older musicians left incomplete and unsatisfactory records behind them, the latter that the older or paedeutical style is almost forgotten in his time. In an article of this length such evidence must be confined to a single testimony, that of Aristotle (*Prob.* xix. 18): 'Why is the concord of the octave alone sounded (on the lyre)? For they magadise that, but no other.'

It may also be pointed out that no other means of producing the eighth note has yet been suggested; that the chelys had only seven strings, and no visible method of stopping for nearly the whole of the 'Best Period' of Greek art, if we are to trust the vase pictures; and, quite incidentally, that the same method of producing the octave is at present in use by Welsh harpists. The controversial point as to the meaning of the word  $\mu\dot{\alpha}\gamma\alpha\delta\iota\varsigma$ , from which  $\mu\alpha\gamma\alpha\delta\iota\dot{\zeta}\epsilon\iota\nu$  is derived, is here noticed, though space does not admit of its discussion. It is to be noted that vase pictures show that the chelys admitted of semitone modification in tuning (not during performance) by means of though plaited on the tuning bar, and engaging the strings, capable of being tightened or relaxed at will.

With the Octave System established, and the means provided for altering the note emitted by a string either of chelys or kithara, the next development of Greek music would naturally be in the direction of altering the intermediate notes of the Tetrachord.

These variations gave rise to different scales which were known by the name of  $\delta\rho\mu\nu\nu'a\iota$ . (Monro notices that the word  $\delta\rho\mu\nu\nu'a$  is used for a scale down to the time of Aristotle, being afterwards replaced by  $\tau\rho\delta\pi\sigma$  or  $\tau\delta\nu\sigma$ , but does not attempt to explain the significance of the change.)

This system of scales, which lasted up to the time of Pythagoras without a rival, can best be explained in connexion with the thonged chelys which continued to use it at least down to the time of Aristotle. For convenience' sake, 4 let us number the thongs capable of raising each string thus:—

<sup>&</sup>lt;sup>3</sup> It is not intended to affirm that this had not been done before; but we have no record of it direct or indirect.

<sup>&</sup>lt;sup>4</sup> As a matter of fact, 1 and 4 were  $\phi\theta o\gamma\gamma o\lambda$   $\dot{\epsilon}\sigma\tau\dot{\omega}\tau\dot{\epsilon}s$ , and were not modified.

The tightening of thong 5 produced the Dorian άρμονία:—

By tightening 2, 5, and 6 was obtained the Phrygian άρμονία:—

For some unknown reason, possibly connected with its alien origin, the Lydian  $\delta\rho\mu\nu\nu ia$  was of a lower pitch, and needed a preliminary slackening of all the strings by a turn of the tuning-bar. The thongs 2, 3, 5, 6, and 7 were then tightened, and the result, as nearly as it can be expressed in modern notation, was:—

This appears to be exactly like our modern scale of Eb major, but it must be remembered that the key-note  $(M\acute{\epsilon}\sigma\eta)$  was not Eb, but Ab.

Another set of  $\dot{a}\rho\mu\nu\nu\dot{a}\iota$  was obtained by screwing up the strings by means of the tuning-bar. These, known as the Ionian, Aeolian, and Syntono-Lydian, will be shown when dealing with the notation.

There remains but one other  $\delta\rho\mu\nu\nu\ell a$ , the Mixo-Lydian, and this was produced by leaving all seven strings slack, so that the seven lowest notes corresponded exactly with those of the Conjunct System. The scale was

This scale played as we play a modern scale has a most weird effect, and many people have doubted whether such a sequence can ever have been accepted as a scale; but if the experiment be tried on the piano of starting on A, descending stepwise to the E, ascending thence to the upper E, and returning to the A, the effect will not be found at all unsatisfactory. Before quitting this branch of the subject for a time, let it be pointed out, that as there were seven strings to the lyre, so there were seven  $\delta \rho \mu o \nu i a \iota$  to be played upon it, a state of things eminently satisfactory to the logical minds of the philosophers.

With the advent of Pythagoras 5 comes a new crisis in the history of Greek music. Perceiving the inconvenience of re-tuning in passing from one scale to another, he added an eighth string to the kithara, with the object of avoiding such necessity, at any rate in the case of two scales, the Dorian and the Phrygian. This contribution to the development of Greek music has been erroneously described as 'completing the octave' (sc. the so-called incomplete scale of Terpander). This is obviously absurd: even if we could imagine the Greeks using such a defective scale for a century and a half, it is well known that Pythagoras recommended that all melodies should be confined within the compass of an octave, a ridiculous precept unless the available compass of the kithara were greater. It appears that, recognizing

the identity of the last seven notes of the Phrygian  $\dot{a}\rho\mu\nu\nu\alpha$  with the first seven notes of the Dorian as regards succession of intervals, he added another string to the kithara tuned to the lower D, and thus created the Phrygian  $\tau\rho\dot{o}\pi\sigma_{S}$ :—

And here we have the beginning of the great schism in Greek music. The theatrical players on the kithara eagerly seized upon and further developed the idea of playing the various scales by extension of compass instead of re-tuning, while the philosophic and conservative element passionately repudiated the innovation and clung to the old  $\hat{a}\rho\mu\nu\nu\hat{i}a\iota$ . These latter, as Aristoxenus shows, were the school known as the Harmonikoi; it is a mistake to suppose that the Greeks were divided into two opposing schools, Harmonikoi and Pythagorikoi. Aristoxenus betrays an equal contempt for both; and, whereas the Pythagorikoi concerned themselves neither with the varieties of scales nor the practical performance of music, the real division was between the upholders of the ancient  $\hat{a}\rho\mu\nu\nu\hat{i}a\iota$  and the advocates of the  $\theta\epsilon\alpha\tau\rho\nu\kappao\hat{i}$   $\tau\rho\acute{o}\pi o\iota$ .

This seems a suitable place for an earnest protest against the use of the word 'Mode' in connexion with Greek music. The Roman ecclesiastical modes, from which the word has been borrowed, are admittedly different from the systems bearing the same names in Greek music; and the greatest confusion has been caused by the translation of  $\dot{a}\rho\mu\nu\nu'a$  and  $\tau\rho\dot{o}\pi\sigma_{S}$ , two names belonging to conflicting systems, by the single word 'Mode.' If the student of philosophy will read his Plato again, taking  $\dot{a}\rho\mu\nu\nu'a$  not as abstract harmony, nor as a 'mode,' but as a Harmonia such as has been described, he will find that many of the comparisons with human life acquire an increased aptness and significance.

The principle of the  $\tau\rho\delta\pi\sigma_0$  having been established, its votaries were not slow in extending its application. Whether the extension was made by Pythagoras or his followers there is no evidence; but it is plain that the omission of the F and the depression of the lowest string to C would give the Lydian tropos in addition to the other two. The stopped notes are given in italics:—

And as a further extension, the lowering of the lowest string to B would give the Mixo-Lydian tropos as well as the other three:—

It is equally obvious that this eight-stringed kithara would play the Syntono-Lydian tropos:—

At some undefined period during this stage the names Mixolydian and Syntonolydian fell out of use, being replaced respectively by Hyperdorian and Hypolydian.

Any further development of the kitharistic system would evidently be in the shape of the addition of strings, the creation of new  $\tau\rho\delta\pi\omega$  naturally accompanying them.

Phrynnis (fl. c. 445 B.C.) added a ninth string to the kithara, which implies the invention of the Hypophrygian tropos:—

$$(B \ c \ D \ E \ f) \ G \ A \ B \ c \ D \ E \ f \ G.$$

Aristophanes here supplies us with a passage <sup>7</sup> not only descriptive of Phrynnis but incidentally strongly confirmatory of the distinction between Harmoniai and Tropoi:—

'And then he used to teach him to learn a song, in the correct position for lyre-playing (literally, without crossing his legs), such as "Dread Pallas, conqueror of cities," or "A Far-flung Cry," straining to a higher pitch the harmonia which our fathers handed down to us (i.e. using the Hypophrygian tropos). But if any of them should seek to tickle the ear by tricks of art, as by executing flourishes such as those intricate ones that the moderns use after the example of Phrynnis, he used to be beaten with many stripes for obscuring the Muses.'

Melanippides (died before 412 B.C.) added a tenth string, thus making possible the Hypodorian tropos.

Timotheus (446-357 B.C.) added an eleventh string to the kithara, the lowest one (proslambanomenos), making possible the Hyperdorian tropos, and extending the compass of the instrument to a double octave:—

Although no special significance seems to attach to the point, it is interesting to observe that, throughout all these additions to the strings of the lyre, A, the original Mese of the lyre, remains as nearly as possible the middle string.

The subsequent extension of all tropoi to the compass of the double octave resulted in the destruction of all distinctive character in the various tropoi, so that Aristotle could say<sup>8</sup> that the Phrygian tropos was so eminently suited for dithyrambic composition that a poet trying to compose a dithyramb in another tropos was likely to pass unawares into the Phrygian. The same tendency to exuberance extended to the intonation. Solo kitharists in the contests vied one with another as to who could produce a new and original tuning of his instrument, so that Aristoxenus defines at least six of these tunings; and these vagaries, aggravated by the mathematical

<sup>&</sup>lt;sup>7</sup> Clouds, 961 et seq. <sup>8</sup> Pol. viii. 7.

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incursions of the Pythagorikoi, reduced the theory of music to such inextricable confusion that it is small wonder that by the time of Anonymi Scripta de Musica (ed. Bellermann) the whole edifice had been reduced to the notation of the Diatonic Genus of the Lydian tropos.

The most impregnable, and at the same time the most fruitful source of information about Greek music, is the vocal notation. From the complete vocal notation ( $\sigma\dot{\nu}\sigma\tau\eta\mu\alpha$   $\tau\dot{\epsilon}\lambda\epsilon\iota\sigma\nu$ ) we can gather without doubt the relative pitches of the tropoi. This can be sufficiently here shown by the comparison of two of them, the Dorian and the Phrygian. It must be premised that the complete list of characters for each tropos in the  $\sigma\dot{\nu}\sigma\tau\eta\mu\alpha$   $\tau\dot{\epsilon}\lambda\epsilon\iota\sigma\nu$  consists of eighteen letters, made up of the signs representing the fifteen notes from AA to  $\alpha$  inclusive, plus the three letters indicative of the three notes (Bb, C, D) of the older conjunct system. The coincidence of the Conjunct D with the Octave D affords a decisive conclusion as to pitch. In the subjoined list of characters, the three conjunct notes are placed in a separate line, and the characteristic octave of each scale is blocked out by double bars.

Remembering that the last note within brackets is D, and that the vocal octave of each scale begins with the first intelligible letter, we can hardly resist the conviction that the Dorian tropos extended from E to E, and the Phrygian from D to D. The same principle applies to all the other tropoi, and the final check of its accuracy is that the Hypo-Dorian vocal octave is thus found to extend from A to A, and we have the authority of Euclid for the fact that 'the Hypo-Dorian tropos can be played either from the lowest to the middle string of the fifteen-stringed lyre, or from the middle to the highest string.'

The total number of characters used in the vocal notation is sixty-six; but if we strip away from each scale all the non-alphabetical signs (with one exception) and make the assumption that the sign Ω shall stand for E—as it certainly does in the oldest scale, the Dorian—we shall get a system of scales which I here submit as being the Harmoniai of the philosophers. The assumption may appear an enormous one; but when we consider that there was an older system of which former records had been lost, that this explanation coincides with the remarks of Plato and Aristotle to a surprising extent, that Aristoxenus describes 10 the system of the Harmonikoi as a close-packed scheme of scales (καταπυκυῶσαι βουλομένοις τὸ διάγραμμα), and that each new development of Greek music was superimposed on the preceding one, it has primâ facie claim to serious consideration.

<sup>&</sup>lt;sup>9</sup> It may be necessary to explain that each line represents the signs for the white notes on a piano in ascending order from A to the

double octave above it.

<sup>&</sup>lt;sup>10</sup> i. 7.

The accompanying diagram of four of the classic Harmoniai as reconstructed from the vocal notation, with the approximate modern equivalents, should almost explain itself. The scales are arranged in descending musical order to make clearer the alphabetical relations of the notes, and the Conjunct Enharmonic Scale has been added for several reasons, one being that it serves in a measure to co-ordinate the rather conflicting testimony of the other scales, and another that it uses the letter N which is not to be found in any of the Harmoniai. The modern musical equivalents are described as approximate, because the Lydian was not exactly a semitone below, nor the Ionian exactly a semitone above, the norm of the Dorian and the Phrygian.

#### VOCAL NOTATION OF THE HARMONIAI.

					1	l l	Ì	1		1	1	ī	[	ĺ		1	1	1	Ī	I	1	1	ì	ī -
Dorian	•			Г			Н				٨	M			П			Т				Ψ	Ω	
Phrygian				Г				0	1			M			П				Υ	Φ			Ω	
Lydian					Ε	Z			ı			М				Р	c			Φ				R
Ionian			Α			Z			1	K				0			c			Φ	X			
Conjunct monic	Enha	ır-					Н						N	0	П						X	Ψ	Ω	
		İ															l							1

#### APPROXIMATE MODERN MUSICAL EQUIVALENTS.

			E	í	l .	ł.	l .	í	1	1	í	F	í.	í	í	f .	ŀ	í	į.			1	1	
Dorian	•			E			D				$\mathbf{c}$	В			A			G				F	Е	
Phrygian				E				D	C#			В			A				G	FΪ			Е	
Lydian					Eb	D			$\mathbf{C}$			В				Ab	G			F				Eb
Ionian	•		F			Eb			Db	$\mathbf{c}$				ВЬ			Ab			Gb	F			,
Conjunct	Enha	r-							ľ															
monie	•	•					D						В	ВЬ	A						F#	F	Е	
												1	1	1					1	1	1	1		

## EQUIVALENTS OF FIRST THREE AS TROPOI.

Dorian	•		E			D			c	В		A			G			F	E	
Phrygian			D				$\mathbf{c}$	В		A		G				F	E		D	
Lydian				C	В			A		G			F	E			D		С	

But whether this theory of the Harmoniai be accepted or rejected, valuable results as to the intonation of Greek music are obtainable from a study of this notation (which also undoubtedly served for the Tropoi, usually called Modes). Before proceeding to this investigation, we must, however, exclude from our purview the Ionian scale, which does not conform to the rules observed in the others, and was described by Heraclides Ponticus as 'a strange aberration in the *form* of the musical scale.'

The first point that strikes the attention is the absolute symmetry of the two tetrachords in each of the three scales as written down. A further scrutiny will show that the letters  $\Delta$  and  $\Xi$  (or N) are lacking in the scheme. This is a very important omission, and one which goes a long way towards

proving that the Greeks used what we call just intonation in the tuning of their scales; also that they were aware of the inherent imperfection of the justly-intoned scale, viz. that the D a true fourth above A, and the D a true fifth above G differ by the small interval  $(\frac{81}{80})$  known as a 'Comma.' In their anxiety to preserve continuity between the older Conjunct System and the Octave System, they were scrupulous in providing that both D's, though theoretically differing by a comma, should be represented by the The difficulty of computing the size of intervals on a uniform plan they got over by pretending that the tone of separation between the two tetrachords was a minor tone, instead of a major tone. This, however, landed them in fresh difficulties as regards the size of various fifths; and their way of overcoming these was to reserve the letter N for the Dorian Conjunct Enharmonic, not using it for other scales; while they counted it in or omitted it in counting as was necessary in computing intervals. A similar device was used with regard to the letters  $\Delta$  and E. The complete proof or these statements would be cumbrous to give, and somewhat dull to the nonmusical expert; but it may be stated that in the complete notation, where the letters have to be repeated with a dash to mark an octave, the letter  $\Delta'$ is frankly ignored altogether, as none of these counting difficulties appear in that portion of the scale.

This parallelism of N and  $\Xi$  (and of  $\Delta$  and E) being conceded, the consistency of the Greek notation becomes almost ideal. If we remember that the Greek mental picture of an interval would be the addition or subtraction of a certain length of string on the kanon, we shall see how closely it corresponds with actuality. The intervals of the Dorian tetrachord in ascending order are E-F (hemitone), F-G (major tone) and G-A (minor tone). The string-lengths corresponding to these four notes (E F G A) when expressed in the smallest whole numbers are 48, 45, 40, and 36. It will thus be seen that the intervals between them expressed as length-differences (not as ratios) would be

 Hemitone
 .
 .
 3.

 Major Tone
 .
 .
 5.

 Minor Tone
 .
 .
 4.

Now if we examine the equivalents of the three tropoi given in the last table, counting both initial and final letters in the lengths of our steps (as we do in modern harmony), we shall find throughout that

$$E-F$$
 = Step of 2 =  $B-C$  = Hemitone.  
 $F-G$  = ", ", 5 =  $C-D$  = Major Tone.  
 $G-A$  = ", ", 4 =  $D-E$  = Minor Tone.

The interval A-B, the tone of separation, does not count in the tetrachordal system, and we have already shown the dodge by which the Greeks avoided its difficulty. It may be of interest to show that the older conjunct system had no such difficulty, and exhibited no weak or ambiguous point. The capital letters indicate the notes, and the small letters between show the

measure of the interval: the modern equivalents of the notes are given above.

ΕF		$\mathbf{G}$		ABb		$\mathbf{C}$		D
ΩΨ	$\chi\phi v$	Т	$\sigma  ho$	пο	$\xi\mu\lambda$	K	$\iota \theta$	Н
Hemit	Major		Min	Hen	Major		Mino	
iitone	or Ton		or T	nitone	or T		or T	
ю	one		one	е	one		one	

The subject of Greek intonation has received considerable attention for many centuries, the arguments in favour of one view or another having been mainly derived from the various treatises from Aristoxenus to Boethius, with occasional references to the vocal notation. The parallel system of instrumental notation, however, seems to have been strangely neglected so much so, that Grove's Dictionary of Music states that 'no rational explanation of the instrumental notation has yet been offered.' This is doubtless largely due to the uncouth appearance of the characters used a happy hunting-ground for the epigraphist. But wherever the strangelooking signs may have come from, the principle on which they are used is sufficiently clear, and valuable results are obtainable from an analysis of that The governing factor in this notation is the use of three positions of the same letter to indicate (as a rule) three adjacent notes distant a semitone from one another. To give an example, E represents the lowest of such a group of three,  $\mathbf{u}$  (the letter turned on its side) the middle note, and  $\mathbf{z}$  (the letter reversed) the highest. The signs thus treated are ERHEFF F CK < C, and there are in addition a number of isolated characters, notably Π, Z, J. Now if we consider the grouping of the notes of the enharmonic genus (octave system), the probable use of each will spring to the eye:-

$$\underbrace{\mathbf{E} \ \mathbf{F} \ \mathbf{F} \sharp}_{\mathbf{F}} \quad \mathbf{A} \quad \underbrace{\mathbf{B} \ \mathbf{C} \ \mathbf{C} \sharp}_{\mathbf{F}} \quad \mathbf{E}$$

An examination of the table of scales will amply confirm this impression, as can be seen from the following excerpt of the normal octave in the three classic scales:—

INSTRUMENTAL NOTATION (OCTAVE ENHARMONIC).

Note.	GREEK NAME.	PHRYGIAN.	Lydian.	DORIAN.
E	Nete	. Z	4	N
C#	Paranete .	. >	ב	λ
$\mathbf{C}$	Trite	. V	u	<
В	Paramese .	.   <		ר
A	Mese	· 7	<	)
F#	Lichanos .	. 3	)	
$\mathbf{F}$	Parhypate .	. L	U	2
E	Hynate	· F	С	

From this portion of the table alone it seems probable that the Phrygian was the oldest instrumental octave scale (the apparent probability increases if we examine the whole table). For it will be observed that the Lydian notation borrows its sign for Mese from the Phrygian Paramese, and the Dorian takes its Paramese from the Phrygian Mese, and its Mese from the Lydian Lichanos. A minor point, on which no stress need be laid, is that the Phrygian notation is wholly rectilinear, and this holds good even when extended to the double octave.

Particular attention is requested to the Dorian notation for B, C, and C#. The lowest note, Paramese, is borrowed from the Mese of the (supposed) primitive Phrygian notation, but its modifications according to the regular plan ( $\sqcap \sqsubset \sqcup$ ) would conflict with the signs for the corresponding portion of the Lydian scale. It is suggested that when the flute was officially received into Greek music, the Spartans gave the national stamp to the Dorian notation by employing two regularly-reversed positions of the sign ( $\Lambda$ ) which was inscribed on the Spartan shields.<sup>11</sup>

Another point of interest in this notation is that it supplies in its clearest form one of the many arguments against the theory that the enharmonic genus proceeded by steps of a quarter-tone.<sup>12</sup> The diatonic semitone (E to F, and B to C) is represented by a step of two, i.e. from one letter to the succeeding one, in the diatonic genus, and the same signs are used for the enharmonic. It seems initially probable, therefore, that the letters would stand for the same notes in the two genera. But the next step of the enharmonic genus (F to F#, and C to C#, as I maintain) is also represented by a step of two; so that if the quarter-tone theory be correct, the letter which stands for F in the diatonic genus does not represent F in the enharmonic, while the enharmonic F is represented by the succeeding letter. This seems strange enough; but a more convincing negative proof arises from the Ionian and Aeolian group of scales, six in all. This group is so obviously artificial in its notation that it would be unsafe to rely on it to prove any positive point; but an examination of its scales reveals the fact that all the upper intervals of the groups of three notes, i.e. all the intervals from F to F# and from C to C# consist of a step of three, proceeding from one sign to the next but one above it. As this occurs more than twenty times in the various scales, it can scarcely be regarded as an accident; and whether it proves anything positive or not, it seems fairly clear that such a step did not represent a quarter-tone, especially as a smaller step represents, in these scales as well as the others, a half-tone.

Another statement, founded on some of the treatises, made about the Greeks is that they habitually used the so-called Pythagorean tuning, with its peculiarly disagreeable thirds.

This system was undoubtedly worked out with much mathematical

<sup>&</sup>lt;sup>11</sup> See Gilbert Murray's Risc of the Greek Epic, p. 40.

<sup>12</sup> It would be idle to deny that such steps

were sometimes used, and much written about; but they were vagaries of the solo kitharist and the theorist.

ingenuity by the theorists; but apart from the known love of the Greeks for beauty, can anyone believe that the string-lengths of the kanon for the notes of the scale computed by Aristides Quintilianus were ever in actual use as a basis for the tuning of the lyre or for guidance in singing? For the purpose of comparison they are here given, side by side with the numbers expressing justly-intoned string-lengths.

NT	RELATIVE ST.	RING-LENGTHS.
Note.	Aristid. Quint.	Just Intonation.
E	3072	24
D	3456	27
C	3888	30
В	4096	32
$\mathbf{A}$	4608	36
$\mathbf{G}$	5184	40
F	5832	45
E	6144	48

This summary ought not to end without the statement that, while an endeavour has been made to clear away from the subject some of the mists that have obscured it for so many centuries, there is no intention of belittling either Greek delicacy of ear or artistic perception. On the one hand, if the theories outlined here are correct, the Greek perception of tone-difference must have been far in advance of anything we can conceive in these days of 'equal temperament'; though this very delicacy of appreciation led at length to a vitiation of taste among the virtuosi like the passion for very 'high' game among gourmets; and in this connexion it is interesting to note Plutarch's remark 13 that 'the later Greeks preferred the surviving archaic intervals.' On the artistic side of the question, it should be stated that all the known examples of Greek music when interpreted on the lines suggested are singable and enjoyable at the present time; the two enharmonic hymns could be sung at sight by a fairly trained choir boy, and some of the later works show so keen a melodic sense that it is quite easy to supply them with modern harmonics as accompaniment, although of course the chordal sequences existed only in the minds of the composers.

J. Curtis.

<sup>13</sup> De Musica, 38, 39.



Greek Music

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## GREEK MUSIC

# By PHILLIPS BARRY

HE materials for a study of ancient Greek music are of two sorts, documentary and archæological.

We have, in turn, two kinds of documentary material. There are, first, a host of incidental references to music and musicians scattered through the literature of the classic and postclassic periods. Secondly, there is a large body of purely technical writings, which we shall here collectively designate as the Music-The oldest of these is the so-called *Pseudo-Aristotle*, ography. a collection of students' minutes of academic discussions relating to the theory and practice of music. Much of the matter is interesting and valuable,—not a little of it quite indispensable. Next in importance, and scarcely less useful, are the treatises of the voluminous philosopher Aristoxenus, surnamed the Musician (c. 300 B. C.). We have from his pen but two extant works, the Principles of Melodics in one book, for beginners, and the Elements of Melodics, in two books, written for more advanced students. Much Aristoxenean material, however, has come down to us in excerpts, preserved in Plutarch's Essay on Music, and in the handbooks of Aristides, Cleonides, and others. The short handbook ascribed to a certain Alypius renders indispensable aid in understanding and deciphering the Greek method of musical notation.

The archæological material is likewise of two kinds. have a few specimens of ancient musical instruments, and many more representations in sculpture and painting of instruments and Yet these are of little more than insignificant value. as compared with the few scores of musical compositions which have come down to us. These are but four, in all,—the Aidin Epitaph, published by Ramsay in 1883, and first correctly interpreted musically by Munro in 1894,—the Ashmunen Papyrus, a fragment of the lost score of the Orestes of Euripides,—and two Ritual Hymns, discovered at Delphi by Homolle in 1893. the Aidin Epitaph is unmutilated. That so little should have survived of the music of the Greeks, beside so much of their poetry, might seem almost incomprehensible. Yet there was a very real reason for it. Not until late in the post-classic period,—certainly, not before the year 279 B. C., had the Greeks devised a convenient

and serviceable method of notation. Scores were few and far between,—Greek music perished for the simple reason that it was not, so to speak, published. Yet small as our *corpus* is, we cannot be too thankful for it,—in fact, without its aid, a study of Greek music would be a fruitless task.

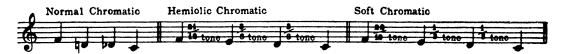
## STRUCTURAL BASIS OF GREEK MUSIC

Reduced to its lowest terms, the structural basis of all Greek music was the consonance of the fourth,—hence the tetrachord was defined as the bed-rock of musical composition. In theory, of course, the possible forms of the tetrachord were infinite, yet in practice, their number was limited to certain recognised differences of genus, shade and species. This limitation was based on the usage of musicians. Aristoxenus, therefore, classified as diatonic every tetrachord containing not more than one semitone, as enharmonic the form admitting quarter-tones, and all others as chromatic. Such were the genera, each with its variations of shade. These differences may be illustrated by means of a diagram:

## Diatonic:



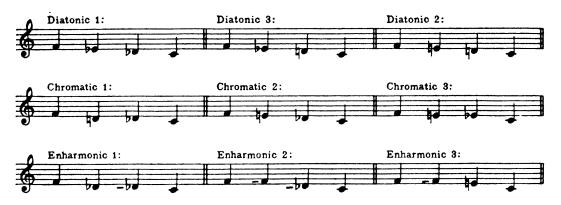
## Chromatic:



#### Enharmonic:



By transposition of the order of the intervals within a particular genus, the variations of figure or species were effected.



The melodic sequence of every ancient composition could be reduced to these forms, used either singly, or in a variety of combinations.

Every possible scale was analysed as made up of tetrachords, or parts of tetrachords, combined according to certain well-recognised and universally applied rules. Let us take a tetrachord of the first diatonic species:



If two of these were so combined that a common note served as the highest tone of the lower tetrachord, and the lowest of the upper, the resulting scale was conjunct, having the range of a minor seventh. Yet if the interval of a tone separated the two tetrachords, the scale was then defined as disjunct, because of the presence of the tone of disjunction. If, however, the conjunct scale were extended to the compass of an octave, by adding the interval of a tone at its base, the scale became of the mixed or alternating form. Or, as represented in modern notation:



The tetrachordal structure, as here briefly outlined, is even of more significance than the absence of harmony and counterpoint as a characteristic evidence of the difference between ancient Greek music, and the music of our own time. If, for example, we think of the structural basis of our music in terms of the tonic chord, we infer that this chord shall be in its fundamental position. To think of Greek music in terms of the tonic chord, however, requires of us also that we imagine the chord in its second inversion.

### THE PRIMARY MODES

The Greeks recognised three primary modes of music, Dorian, Phrygian and Lydian, the tonal sequences of which were as given in the diagram:



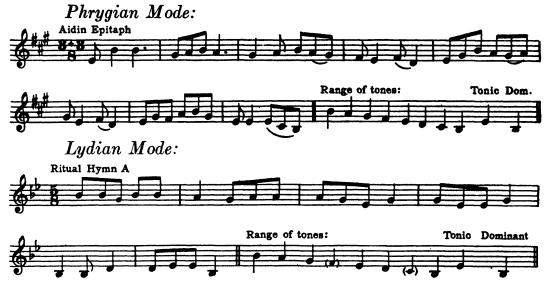
From the Greek point of view, these diatonic scales might be analysed as composed of tetrachords, respectively, of the first,

third and second species, arranged in the disjunct order. It is also possible for us, disposed as we are to think in terms of harmonic possibilities, to define them according to the structure of their tonic and dominant chords. The Dorian has a minor third in both, the Lydian a major third in both, while the Phrygian has a major third in the tonic and a minor third in the dominant chord. Such an analysis devolves at once upon the Greek interpretation of a certain tone as the *tonic* of the scale.

In the course of a most suggestive and illuminating discussion of the tonal structure of the Dorian, the first of the primary modes, as represented by the scale of the lyre in standard tune, the Pseudo-Aristotle clearly shows that the fourth of the scale, the tone rendered by the middle finger string of the lyre, was the tonic. Every Greek boy who learned to play the lyre in school, knew that the condition of being in tune was for any note of the scale governed by its relation to the tone of this middle finger string. the middle finger string were out of tune, every other note of the scale, by reason of the fact that the very condition of its being in tune at all was lost, was felt to be out of tune. Yet if any other string were out of tune, while the middle finger string was at true pitch, that string which was out of tune was the only one felt to render a false note. One could not wish for a better exposition of the principle of tonality, which we now recognise to be the principle which requires that every note of a modal scale be felt as "something at a certain distance from, with a certain relation to another tone," that is, the fundamental or tonic.

The fourth of the scale then, was, for the primary modes, the tonic, so that the lowest tone of the octave was the inferior dominant. Another fundamental principle of composition was that on this inferior dominant, every melody cast in a primary mode should come to a close. We have illustrations of this usage in our corpus of Greek melody, showing the cadences in the Dorian, Phrygian and Lydian:





This rule of cadence structure was inviolate, and formed a criterion for the genuine. That is to say, the violation of it in seven melodies hitherto supposed to be Greek, since they are transcribed in the Greek notation, renders final proof that these melodies are not authentic, but are forgeries by persons who were quite unacquainted with the grounds and rules of Greek music, as we know them from the unanimous testimony of the musicography and the four unimpeachable scores.

In the late post-classic period, however, when the refinements and artificialities, not only of Asiatic-Greek, but of Asiatic music had permeated the whole being of the art, certain composers, the futurists of their time, did apparently break the rule of the cadence, though not in the manner in which we find it broken in the forgeries. That is, they permitted a Dorian melody to close on a tone lying a semitone below the inferior dominant. This usage is illustrated in the second part of the melody to Ritual Hymn A:



The mode is clearly Dorian chromatic, with the close indicated in the diagram. Yet the f-sharp,—an example of the futurist tendencies mentioned by Aristoxenus, permitting alteration even of the notes bounding a tetrachord,—serves as a leading-tone to the inferior dominant. This is evident from the phrase



so strangely modern in its effect. Only to Greek ears, there was equal satisfaction in having a leading-tone with a retrogressive as well as a progressive tendency. Such a leading-tone might follow, as well as precede the tone to which it tended:



In this place, it serves as the *de facto* final tone of the cadence, yet without any violation of the rule of melody, since it serves, as it were, to throw back the attention all the more forcibly to the true closing note, that is, the inferior dominant.

There was also another requirement of good melodic structure, observed by all the best composers, namely, that the melody was to revert frequently to the tonic,—even more so than to any other tone. We may observe, from the examples already cited, especially the Aidin Epitaph, how generally this rule was followed. Let us examine, also, the Ashmunen fragment of the Orestes-music:





In the papyrus, a sign which does not stand for a musical note, marks the close of a rhythmical phrase. The range of tones is:



wherefore we conclude that the mode is Dorian chromatic. There are two instances of the Dorian cadence, the clearest in the third phrase:



It is to be noted also that two phrases begin on the tonic. The effect, as the effect of frequent repetition of the tonic in the melody, was to impress the tonality on the consciousness of the hearer. We are content, as it were, to imagine the presence of the tonic: Greek music, lacking the harmonic development of our own, needed evidently that the tonic be thus frequently repeated.

We shall hereinafter refer to the type of cadence associated with the primary modes, as the mesotonic cadence, to signify that as the tonic is the mese, or fourth of the scale, the tones which by their order determine the modality, lie in the lower half of the octave. It is clear, from the examples before us, that over a period extending from the year 408 B. C., when the Orestes was acted, down to the first century A. D., this mesotonic cadence was characteristic of the primary modes.

### THE SECONDARY MODES

But the resources of the composer were not exhausted with the possibilities of the primary modes alone. In strict composition, tones lying above or below the range of the octave scales were not generally used for Dorian, Phrygian, or Lydian melodies, especially for Dorian. The Ashmunen *Orestes*, it is true, admits the inferior subdominant,—yet, on the other hand, the melody of the Aidin Epitaph is restricted to the compass of the octave. With the secondary modes, however, a larger latitude of free composition was permitted. That is, not only the order of the intervals in the final cadence, but the actual register of tones employed in a given composition was of importance for the structure and effect of the melody. Technically, the term tense, originally applied to the primary modes, but later restricted to the Lydian, was made to signify a type of secondary mode, admitting to the melody, tones lying a fifth above the range of the octave scale. The other type of secondary mode, characterised by tones lying below the range of the octave, was called relaxed. We shall here consider the secondary modes known by the names Mixolydian, Ionian, Hypodorian, Hypophrygian, Hypolydian, and Locrian or Hyperphrygian.

The Mixolydian mode, as its name suggests, was not only Asiatic-Greek, but understood by composers to be in reality a kind of artificial structure in which were blended Dorian and Lydian characteristics. Aristoxenus ascribed its invention to Sappho: it was freely used by the Attic poets, especially Euripides, sometimes in the form we shall hereafter describe as the intermodulating Dorian-Mixolydian. We know the sequence of its intervals, from the description of the Mixolydian species of the octave scale, in the Musicography:



That its true relation to the Dorian was as indicated in the diagram, may easily be shown.

In the music of our Ritual Hymns, are several passages, the structure of which is demonstrably Mixolydian. Of these, the following, from Ritual Hymn B., has suffered least from mutilation of the stone:



The scale of this melody, as indicated in the diagram:



follows the tonal sequence of the Mixolydian species of the octave, while the final cadence is observed to lie within the range of the tones corresponding in pitch value to the Dorian subdominant, and the octave of its tonic. Clearly, then, the intrusion of the high note in the seventh measure, an octave above the Dorian tonic, is to fix, for the hearer, according to the familiar law of good melody, the position of the Mixolydian tonic at this point. The closing note, then, as we should expect it, is a fourth below the tonic, on the Mixolydian inferior dominant, an octave above the Dorian inferior dominant. Moreover, the tonal sequence of the cadence follows a certain stereotyped form, which occurs over and over again in the Mixolydian portions of Hymn B, and as a modulation also in Hymn A, so characteristic, that it may be called the Mixolydian melodic motif:



Evidently the repetition of this melodic motif was a special rule of composition for this mode, as the repetition of the tonic was for the primary modes. And since the Mixolydian tonic was the second highest note of the scale, it is proper to reserve the term oxytonic for the Mixolydian cadence.

The intermodulating form of the Dorian-Mixolydian is also well illustrated in the foregoing example. In the third measure, the melody drops a full octave from the Mixolydian inferior dominant to the Dorian. Such a modulation, however, is but transient, for the next step is back again to the Mixolydian. The effect is rather more apparent in the closing measures of the sixth and seventh parts of the melody of Ritual Hymn B, both of which are otherwise Mixolydian:



The relation of the two modes is shown by the accompanying diagram:



Similarly, modulation from the Dorian to the Mixolydian is produced by the upward skip of the octave, as in the following example:



The effect of the Mixolydian, whether or not used in intermodulation with the Dorian, was in the use of the high tones, which imparted to a melody otherwise Dorian the suggestion of Asiatic threnodic music, written in the high-keyed Lydian mode. There was not the same difference of modality between Dorian and Mixolydian that obtained between Dorian and Phrygian, since there was no change in the order of the intervals bounded by tonic and dominant.

The earliest mention of the Ionian mode, a relaxed mode, as compared with the Dorian, is by Pratinas of Phlius (c. 510). It had long been the favorite mode of the Lydian-Greek school of erotic and convivial lyric, of which the Teian composers Pythermus and Anacreon were the most noted exponents. Structurally, the scale of the Ionian was nothing but the scale formed of two tetrachords of the form characteristic of the Dorian mode, joined by the method of conjunction:



The original relation of Ionian to Dorian, that is, as a secondary mode to its primary mode, was as given in the diagram. We may note also, that this same scale was rendered by the strings of the Lydian *barbit*, a peculiar form of bass lyre to which Pythermus and Anacreon sang their light lyrics.

We have in the music to Ritual Hymn B, several passages set in a mode, the melodic sequence of which corresponds exactly to the chromatic form of the Ionian scale. Of these, the following is the best:



Since, however, the composers of the music to this hymn have treated the Ionian but as a form of the Dorian with a minor supertonic, they have failed to retain its true character as a relaxed form of the Dorian. We shall, therefore, more correctly speak of it as Pseudo-Ionian.

We may here conveniently discuss also the peculiar melodic structure of the music to the Coda of Ritual Hymn B:



The range of tones in this melody is as follows:



The obtrusiveness of the skip of the major third in several measures shows the composer's intent clearly. That is, he introduced a peculiar form of intermodulating Dorian and Pseudo-Ionian:



In each, the scale is of a double gapped pentatonic type, save that to the Dorian is prefixed the inferior subdominant. As before, the true relation of Dorian and Ionian is lost sight of. The composer, too, sought to show himself an archaist, in that he borrowed the pentatonic gapped scale from the ancient traditional Ritual Arias ascribed to a mythical Asiatic composer, Olympus of Mysia.

Pratinas, likewise his contemporary Lasus of Hermione, mentions also an Æolian mode. Lasus, in fact wrote a Hymn to Demeter, set to a melody in this mode, which he describes as a bass air. This Æolian mode was indentical with the Hypodorian, a relaxed form of the Dorian, extending a full tone below the Ionian:



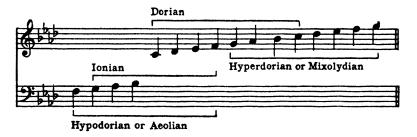
Similarly, the Hypophrygian and Hypolydian modes were, so to speak, plagal forms of the Phrygian and Lydian:



Yet of the use of these forms of relaxed modes in melodic composition, we are not informed. Only in the case of the Hypolydian, we know that composers followed the example of the Lydian-Greek Polymnestus of Colophon, in associating the mode with the soft diatonic:



Let us now summarise our conclusions relating to the melodic interassociation of primary and secondary modes. We may illustrate by a diagram:



Herein the Dorian mode, which occupied a certain known tonal range, is the primary form. Below it and above it, respectively, lie the Hyperdorian or Mixolydian and the Hypodorian or Æolian, also the Ionian. A similar relation existed also between the Phrygian mode and its secondary forms, the Hypophrygian and the Hyperphrygian or Locrian:



It will be observed that the order of intervals in the Locrian mode corresponds exactly to those of the Hypodorian. Hence in the musicography, the Hypodorian species of the octave is called also Locrian.

#### Melodic Composition

In dealing with the ways and means of composing music, we are obliged to specify our subject as melodic composition. most significant point of difference between Greek music and our own, is, as we have already intimated, that the development of Greek music followed a melodic, not a harmonic course of evolution. This was a very real difference, of course, yet it was not a difference of the sort to warrant a word of disparaging criticism. Music is a universal language only in the sense that speech is itself universal, an expression of certain parts of the thinking and feeling aspects of human consciousness. It is inevitable that the world's history should show an indefinite number of local varieties of expression,—the musical art of the Greeks was one such form, and our musical art another. Moreover, if the Greek composer had failed to develop the possibilities of harmony, he had far exceeded modern composers in his power of melodic expression, according as his resources were so much greater. A melody, for example, admitting the third part of a tone, was nothing unheard of for the Greeks, yet no composer in our time has ventured to follow Busoni's suggestion that this interval may be made melodically available.

Within the limits of the present article, it is not possible to go much into detail with regard to the historical development of the art of music during the classic period. Certain important matters, may, however, be submitted to the reader's attention.

There were two recognised and well-defined schools of composition, which we may call the Old Classic and the New Classic. The former group of composers wrote in a strict, severe style, long associated with the works of Pindar, Simonides and Æschylus. The chromatic type of melody was not used at all; modulation, involving change of mode or genus, only very sparingly. On the other hand, the New Classic school insisted on the right of the composer to be a creative artist, to express his own individuality in his work, and to establish his own, rather than to follow tra-Composition was free,—any or all genera or modes were at the musician's disposal, and especially, much use was made of modulation. The leading exponents of the New Classic art, were first of all, Lasus, the pioneer, and Philoxenus, Euripides and Timothy, each supreme in his own respective genre, the Dionysiac Choral, the lyric drama, and the citharodic aria. Timothy, in fact, might be called the Greek Debussy. As between the merits of Old Classic and New Classic art, the critics of ancient times, especially Plato and the comic poets, decided in favor of the former; as we believe, quite unjustly and mistakenly.

Our corpus of Greek melody, small as it is, is enough to acquaint us at first hand with the differences between the Old Classic and the New Classic styles. The melody of the Aidin Epitaph, in its charming simplicity cannot but recall the best of the Old Classic style, while the Ashmunen fragment of the Orestes, representing Euripides' most mature work, is equally characteristic of the New Classic manner. Moreover, in the music to our Ritual Hymns, we have not only the influence both of the Old and the New Classic schools, but some evidences of the crosscurrents in taste which prevailed during the post-classic period, namely futurism, so to speak, and archaism.

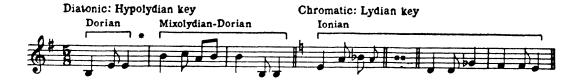
Before proceeding to give an analysis of the Ritual Hymns, let us consider the important subject of modulation.

In our music, modulation is not nearly as extensive a means to the adornment of a piece as it was in Greek music, for the simple reason that our melodic resources are not so great. That is, it involves for us change of key, and to the extent of shifts from major to minor, or vice versa, change of mode also. A Greek composer, however, had a choice not only of fifteen keys for intermodulation, but had three genera and a large number of modes as well. Hence the musicography distinguishes modulation by genus, mode and key, as embracing the less complicated forms. We have already dealt with the intermodulating Dorian Mixolydian,—we may here add certain examples of the other forms.

Change of Genus:



Change of Key,—also of Genus and Mode:



Yet a fourth kind of modulation involved a change in the whole plan of composition,—that is, of genus, mode and key.

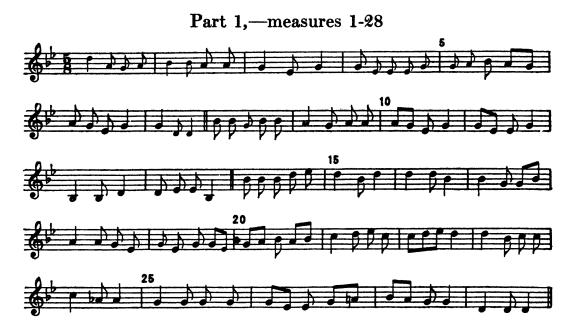
STRUCTURAL ANALYSIS OF THE MUSIC OF RITUAL HYMNS A AND B

### RITUAL HYMN A

The music of this hymn, which is set in the Phrygian key, is of three parts:

- 1. Diatonic,—measures 1-28,
- 2. Chromatic,—measures 29-57,
- 3. Diatonic,—measures 58, ff.

Each of these parts may be submitted to a detailed examination.



The first seven measures are fragmentary,—yet the Dorian mode is indicated. We have therefore restored the cadence in accordance with such tonal suggestion. The succeeding phrase, 8-13, is Lydian. In 14-28, the final cadence is Dorian, while modulations to the Pseudo-Ionian, in 24, and to the Mixolydian in 21-22, are evident.

Part 2,—measures 29-57





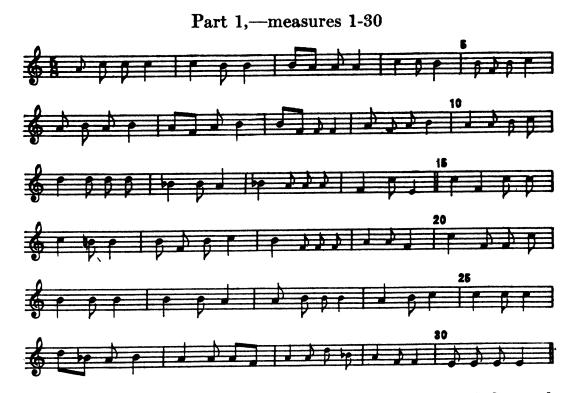
This part opens with a sudden and abrupt change from diatonic to chromatic. The mode is Mixolydian in 29-31, shifting with a change of key as well, to Dorian in 32-4, and back again to the Mixolydian in 35. A cadence, with change of key, and of mode to the Dorian, occurs in 37. A new phrase begins in the latter part of 37, with a cadence in 43,—the mode being Dorian, save for a transient modulation to Pseudo-Ionian in 37. This is followed by a third phrase, at first Dorian, changing in 45 to Phrygian diatonic, returning in 46 to Dorian, with cadence at 47. The final phrase, 48-57, is an unusually elaborate and beautiful example of the Dorian chromatic, with the peculiar close on the leading-tone to the inferior dominant.



The upward skip of the octave in 58, indicates a quick shift from the Dorian to the Mixolydian, the persistence of which is shown by the range of the melody in the upper tetrachord. In 78, we have the melodic motif, and in 79, a transient modulation to the Dorian, with the typical Mixolydian cadence in 83. The musical appropriateness of this mode, which was intended to convey a suggestion of excitement and tense emotional strain, is particularly to be noted, as the lines tell of the conflict of Apollo and the Python.

## RITUAL HYMN B

Of this hymn, there are extant ten parts,—the first seven more or less complete and amenable to analysis, the next two quite defective. The tenth part, or Coda, is also much mutilated.



The key is Lydian, corresponding to our *natural* key, and the mode Dorian, with transient modulation to Pseudo-Ionian in 11, 12, 25. One special feature is the frequency of *melodic tension*, the consecutive repetition of a note, as in 20-21.





With a downward skip of a fourth, the key changes from Lydian to Hypolydian. The mode, at first Dorian, shifts suddenly in 31 to the Mixolydian, with a transient modulation back to the Dorian in 39. By the frequent iteration of the Mixolydian melodic motif



retained in the final cadence, the modality of this part is made quite evident.



This part, too, is in the Mixolydian mode, and the Hypolydian key. A transient modulation to the Dorian occurs in 50. In 56, the characteristic tonic of the Mixolydian is introduced to stabilise the melody.

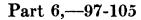


The change of key to the Lydian would indicate a rise of a fourth, if the melody of the preceding part had ended with a Dorian cadence. Yet since the cadence was Mixolydian, with the closing note on the octave of the Dorian inferior dominant, the change of key, despite the fact that the Lydian lies a fourth above the

Hypolydian, is effected by a downward step. For the first time, the chromatic genus is introduced, set to the Pseudo-Ionian.



In this part, the key changes back to Hypolydian, while the presence of the melodic motif in 68, or with variations in 83-4, 92-3, shows that the mode is Mixolydian. The final cadence is Mixolydian-Dorian.





A return to the Mixolydian is shown by the opening note, and by the melodic motif. The cadence is again Mixolydian-Dorian.



The key changes from Hypolydian to Lydian, with the upward step of the fourth. Again the genus is chromatic, the mode Pseudo-Ionian.

Part 8,-119 ff



Once more, key and mode change, to Hypolydian and Mixolydian,—the latter with a transient Dorian note of introduction.

Part 9,—I-IX



This part is so defective that little can be made out of it. Yet the modality is clearly Mixolydian, as the presence of the melodic motif indicates. The fact that the motif is set a full fourth higher than in other Mixolydian parts of the music, establishes the fact that the key is Lydian.

Part 10,—Coda: 1-14



The key is still Lydian,—the mode a peculiar form of intermodulating pentatonic Dorian and Pseudo-Ionian, as we have already shown. We may add that the rhythm, in heptuple time, illustrates

the composer's futurist tendencies, for Aristoxenus declares heptuple rhythm impossible.

### ANTIPHONAL MELODY

The word antiphony had for the Greeks the special connotation of the interval of the octave and the degree of consonance associated with it. It was a musician's term, for which antiphthong, antipsalm and magadism were synonyms. The antiphonal melody was the simplest and, to the Greeks, the only possible form of part-singing, that is to say, an arrangement of parts in parallel octaves. Such was the effect of a choral song, rendered by a mixed choir of men and boys.

By means of a simple mechanical device called magadis, evidently a sort of detachable bridge, it was possible to render an antiphonal melody on any instrument of the lyre or harp type. The usage, as well as the name, originated among the Semitised Lydians of the Neo-Lydian empire in the sixth century B. C., from whom, in turn, the Lydian-Greek composers Alcman of Sardis and Anacreon of Teus derived both. Anacreon sang his light lyrics of women and wine to the accompaniment of a tenstringed Lydian psaltery, which, when provided with the magadis, had its compass virtually doubled. We may illustrate the effect by a diagram of the scale of the octochordal lyre:



With Anacreon, who was one of the court poets of the Pisistratid aristocracy, the magadis and the Lydian method of singing in parallel octaves came to Athens. Long after the use of the device had been given up, when no one knew whether the magadis was a musical instrument or not, the name was applied to the antiphonal chant. Thus magadism meant for the musicographers, the method of singing a melody written for a mixed choir.

Not only vocal, but instrumental music was rendered in parallel octaves. We know that the Semitised Lydians, when the Greeks first came in contact with them, played instrumental duets on the large triangular Phrygian harp and the Lydian psaltery. According to one tradition, the Lesbian professionals composed such duets for bass lyre and psaltery. In the post-classic period antiphonal duets of pipes and strings were sometimes performed.

### Instrumental Accompaniment

Two forms of instrumental accompaniment were known to the Greeks, namely, the homophonic and the heterophonic.

Homophonic accompaniment, that is, when the accompanist did but play the air on his instrument, while the voices rendered it in unison, was believed to have been a very ancient usage. In the classic period, it was revived for the dramatic solo song, as this genre was developed by Euripides. For this purpose, the lyre was not used, as it was held that voice and strings did not blend with sufficient smoothness to produce the best artistic effect. Instead, the pipes were employed, on the theory that as the tones of pipes and voice were both produced by air, the blending necessary for a satisfactory accompaniment was the more readily produced.

Technically, from the point of view of the musicographers, who, beginning with Aristoxenus, wrote on instrumentation, the voice was a musical instrument,—in fact, the perfect instrument. From an early time, certain composers had used the voice for accompaniment, in place of lyre or pipes. Thus the so-called aulodic aria was a pipe solo with an accompaniment rendered by the choir. In this case, the choir sang the lines of a hymn. Yet Archilochus (c. 648 B. C.), and following him also Æschylus and Philoxenus, wrote melodies to be accompanied by vocal imitations of the tones of the lyre,—such imitations consisting of the repetition of onomatopoetic syllables or words, tenella, phlattothrat, thretanelo. Aristophanes, in the Frogs, makes Euripides, before Dionysus as musical critic, render a burlesque of Æschylean music:

EURIPIDES: (Sings) "Ho, for the twin-throned might of Hellas' youth,—

Sing phlatto-thrat, sing phlatto-thrat!

DIONYSUS: Sing flat o' thrat! How's that? A tune you stole In Marathon, some rope-walk chanty, eh?"

The allusion to the rope-walk chanty lets us know that the folk-songs of the ancients had their unintelligible refrains. Such accompaniments were called *teretisms*, that is, "twitterings." Sometimes such teretisms were made to imitate the accompaniment by pipes, more correctly known as the *niglare*. The use of the niglare, which must have been some sort of whistling or yodeling, was originated by Lamprus, the teacher of Sophocles, and extensively employed by Timothy of Miletus.

The expression *subordinate* was technically applied to the second, or heterophonic form of accompaniment. This accompani-

ment, except in the form of a drone-bass, was invariably pitched higher than the melody. This usage constitutes another of the important points of difference between Greek music and our own. It is briefly illustrated by Aristoxenus, whose statements may be diagrammatically rendered:



We have an example of heterophonic accompaniment in the Ashmunen papyrus of the Orestes:



The use of heterophonic accompaniment in the form of a drone-bass was but sparing. It is known that it was characteristic of music performed on the curious Phrygian double-pipe, of chanter and drone. Moreover, since the Greeks had the bagpipe, they must have felt that the drone-bass was the peculiarity which made the instrument seem always exotic. We may take the word of Aristophanes in the *Acharnians*, that the Greeks of his time had little taste for the bagpipe:

BŒOTIAN: Ye Theban laddies, a' o' ye, coom heir,

Wi' pipes o' bane, blaw yon wee doggie's hide!

DICÆOPOLIS: Dog-gone yel Hornets, buzzing round my door, Bumble-bee pipers, Chaeris' own, to swarm

With me? Where did they come from, dash their eves!

Chaeris was one of the worst of pipers, so that the association of his name with the music of the bagpipes voiced dislike for the instrument even more emphatically than the curses of the enraged citizen whose sleep had been murdered by the street musicians.

While we are considering instrumental accompaniment, a word or two on the subject of musical instruments will not be out of place.

The characteristic instrument of the Greeks (the only one, in fact, which Plato thought a Greek should ever play upon) was the lyre. Yet it was not an invention of the Greeks, but a relic of the pre-Hellenic Minoan civilisation. The Minoans, in turn, had derived it from Egypt, where, too, it was exotic, though imported by Semitic Bedouins as early as the year 2200 B. C.

Ultimately, the lyre came from China. In its most familiar form it had eight strings, rendering the Dorian octochord. Sometimes however, it was made with but seven,—leaving out the mediant of the scale:



We have already mentioned the heptachordal bass lyre, or barbit of the Lydians. Beside these forms, there was also the cithar of the Asiatic-Greek professional, introduced into Athens by Phrynis of Mitylene in the year 445 B. C. The cithar was a larger and more elaborate instrument than the ordinary lyre, much more difficult to play upon. Phrynis used one with ten strings, while Timothy of Miletus tells us that his cithar had eleven.

No other stringed instrument ever enjoyed good repute among the Greeks. The Lydian psaltery, introduced by Anacreon, was too much associated with Anacreontic morals, while the case of the harp was even worse. Four kinds of harps were known in the classic and post-classic periods. There was the large triangular harp popularly known as Phrygian. A smaller instrument of similar shape but of different construction was The nabla of the Syrians was identical with called the sambuke. the Psalmist's instrument with ten strings. Lastly, the phanix was nothing but the curious boat-shaped harp of the Egyptians. All these had been introduced into Greece by professionals from the East, who began to come in soon after the Persian Wars, and continued to minister to the vulgar taste of the nouveaux riches with their loose songs and worse dances. To decent people everywhere, the manners of these professionals were beyond endurance, so much so that no form of the harp could ever become popular except with a limited class. The same was true of the lute, introduced from Asia in the fourth century B. C.

Of wind instruments, the Greeks had many different forms, exclusive of the horn and trumpet, and generically distinguished by the names syrinx and aulos. The former were of the true flute type, including the familiar Pan's pipes, and the Egyptian fipple-flute. There is no evidence that the Greeks had any instrument corresponding to our cross-flute or piccolo. All other pipes, generically called aulos, were provided with reeds, and generally played in pairs. The Lydian pipes, for instance, the form commonly used for accompaniment of choral odes and solo songs on the Attic stage, had two straight pipes of equal length, fitted

with a curious detachable muzzle-like mouthpiece. In the postclassic period, however, two forms of single pipe, used respectively in the rituals of Isis and Osiris, were introduced into Athens. Of these, the pipe of the Isiac mysteries was played upon in the same manner as our flute, but had its reed inserted in the lateral mouthpiece. The other form of Egyptian reed-pipe, sometimes represented as of conical bore, may have been an oboe.

Nothing better illustrates the extent to which the Greeks, in developing a musical art of their own, were indebted to older and non-Hellenic civilisation, than the names of musical instruments. The Asiatic harp, which every Greek of the classical period knew was exotic, bears the good Greek name trigon,—that is, "triangle." Otherwise, the name of every musical instrument, including the five names of the lyre, is a foreign word.

### NOTATION

As early as the time of Aristoxenus, the Greeks had a simple system of diastematic notation. This method, however, was little used, and in time entirely supplanted by a tonic notation, in which all existing scores of Greek music are written. notation, the basis of which was the twenty-four letters of the Greek alphabet, has been quite incorrectly assumed to be very The earliest record of its use, however, is in the scores of the Delphic Ritual Hymns, engraved on stone in 138-128 B. C. We have besides, the libretti of the Hymns of Aristonous, engraved on stone at Delphi in 279 B. C., which are not provided with a score of the music. Now this Aristonous was the most distinguished composer of his time, highly honored by the Delphians. It is inconceivable, therefore, if the tonic notation had been in use at the time, that the music of his hymns should not have been preserved as well as the lines. We must conclude, therefore, that as late as 279 B. C., the tonic notation had not been invented. This conclusion is strongly reinforced by the fact that Aristoxenus, who was a contemporary of Aristonous, knows nothing of the tonic notation.

From the testimony of the musicographers Aristides, Gaudentius and Alypius, we learn that the two forms in which the tonic notation has come down to us were distinguished by usage as vocal and instrumental. With these statements, the testimony of our scores agrees. Thus, the melodies to the Orestes, to the Aidin Epitaph, and to Ritual Hymn A, are notated in the vocal notation. In the Orestes score, certain signs of the instrumental

series are used to mark the close of a phrase, or to notate accompaniment. Since Ritual Hymn B was in reality an instrumental aria with a vocal accompaniment consisting of the lines of the hymn, it was correctly notated in the instrumental signs.

The complete roster of characters for both instrumental and vocal notation is as follows:

Let us study these in detail, in order that the derivation of all the signs from the letters of the Greek alphabet

### ABTAEZHOIKAMUZOHPZTTΦXΨΩ

may be made clear.

Since the number of tones for which symbols were required, far exceeded the number of letters in the alphabet, it was necessary to use, not only the letters in normal form and position, but also to resort to the devices of alteration of form or position, or both, and to the use of diacritical signs. A different method was employed for each kind of notation, as we shall show. For the present, however, we are concerned only with the forms of the characters.

### I. VOCAL NOTATION

In this system, the tones lying within the range of the socalled Dorian decachord, were notated by the use of the letters in normal position, as indicated in the diagram.



The reason why the Greeks employed what seems to us an unnecessarily large number of signs will be considered presently. All other tones, both above and below the range of the decachord,

were notated by signs which were nothing but altered forms of the same familiar Greek letters. We may herewith summarise the vocal characters, as distributed to their respective classes:

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1. Normal position:
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ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠΡΣΤΤΦΧΨΩ
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- 2. Reversed position:
- 1, that is,  $\gamma$ .
- 3. Recumbent position:
- $\rightarrow$ ,  $\bowtie$ ,  $\bowtie$ ,  $\rightarrow$  that is,  $\iota$ ,  $\kappa$ ,  $\xi$ ,  $\phi$ .
- 4. Recumbent reversed position:
- $\dashv$ ,  $\dashv$ , that is,  $\tau$ , v.
- 5. Inverted position:
- V,  $\nabla$ , V, W N, H, D, L, L,  $\Lambda$ , V, that is, a,  $\delta$ ,  $\lambda$ ,  $\mu$ ,  $\nu$ ,  $\pi$ ,  $\sigma$ ,  $\tau$ , v,  $\psi$ ,  $\omega$ .
- 6. Mutilated:
- R, F, 7, A, that is,  $\beta$ ,  $\epsilon$ ,  $\zeta$ ,  $\eta$ .
- 7. Mutilated recumbent:
- 8. Doubled:
- 3, that is,  $\sigma$ .
- 9. With diacritical sign:
- Q, \*, that is,  $o, \chi$ .
- 10. With the sign of the Octave:
- υ', A', Γ', Z', H', I', K', A', M', N', Ξ', O'.

The characters notated with the sign of the octave (') were used to transcribe notes lying an octave above the notes represented by the corresponding signs undistinguished by the discritical mark.

# II. Instrumental Notation

The instrumental notation, for which a hoary antiquity has quite without warrant been assumed, was invented somewhat later than the vocal, and derived directly from it. It makes use of nineteen characters:

$$\Gamma$$
,  $E$ ,  $Z$ ,  $H$ ,  $K$ ,  $N$ ,  $C$ ,  $T$ ,  $F$ ,  $H$ ,  $\prec$ ,  $\square$ ,  $\mathcal{E}$ ,  $H$ ,  $\mathcal{F}$ ,  $M$ ,  $\Pi$ ,  $\mathcal{E}$ ,  $\square$ .

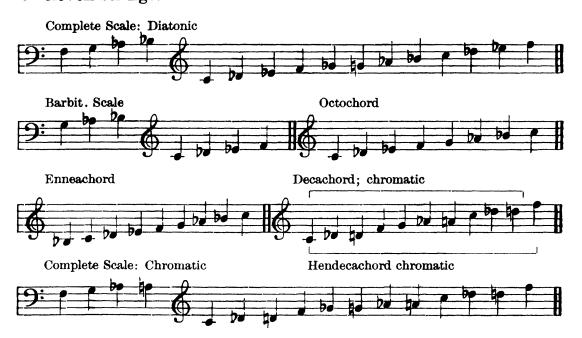
These characters were chosen quite at random from the entire series of vocal signs,—nine of them without change of form or position,—the rest, however, subjected to some necessary alteration. Even at a glance, the reader could not fail to identify all but one or two of them. For the sake of added clearness, however, we add the accompanying diagram:

- 1. Unaltered signs,—including three with the signs of the octave:
- Γ, E, Z, H, K, N, C, T, F, Z', K', N'.
- 2. Altered signs:
  - 1. Recumbent:  $\triangleleft$ ,  $\square$ ,  $\vdash$ ,  $\vdash$ ,  $\vdash$ , that is,  $\Lambda$ ,  $\Pi$ ,  $\Upsilon$ ,  $\Upsilon$ .
  - 2. Reversed:  $\mathbf{H}$ ,  $\mathbf{E}$ ,  $\mathbf{H}$   - 3. Mutilated: M, that is, M.
  - 4. Mutilated reversed:  $\Pi$ ,  $\Gamma$ , that is,  $\Delta$ ,  $\Omega$ .

The tonic notation was originally devised for the notation only of chromatic melodies, a fact which constituted further proof of its late origin, for the vogue of chromatic music was only beginning in the time of Aristoxenus. Yet it was not the invention of a musician, but of a musicologist, who set it to render fifteen transpositions of the so-called Complete Scale of Aristoxenus.



This Complete Scale, comprising the range of the average voice, and known as the Dorian or standard Key, was an expansion of the earlier scales of the Greek lyres,—the heptachord of the *Lydian barbit*, or bass lyre, the octochord of the amateur's instrument, and the scales of the *cithar* of the professionals, having nine, ten, or eleven strings.



We have already observed that in the notation of the tones lying within the range of the decachord, the Greek musicologists used what seemed an unnecessarily large number of signs. This usage, which extended throughout the system, was due to an interpretation of the scale as formed of a series of overlapping tetrachords:



The practical effect of such an interpretation was the distribution of the signs in groups of three, as required for the notation of the so-called pycna, or chromatic sequences of semitones.

The distribution of characters for the notation of these chromatic sequences was not according to the same method for both kinds of notation. Thus, according to the vocal notation, sequences of tones were transcribed by complete or partial alphabetic sequences of signs. Complete alphabetic sequences were used wherever possible,—



otherwise, partial sequences, treated as if combined of groups of two complete sequences, in such a way that the resulting partial sequence included the first and third signs of the first sequence, and the first of the second:



In the instrumental notation, however, since the characters did not form an alphabetic sequence, a different method was necessary. Thus, musicians used sequences of form and position. This is evident from the notation of the tones lying within the range of the decachord:



Only the following signs were usable in the three positions,—

$$\Gamma$$
, E, K, C, F, H,  $\triangleleft$ ,  $\boxminus$ ,  $\xi$ ,  $\varTheta$ ,  $\nearrow$ .

forming the groups:

$$\Gamma$$
 Д  $\Gamma$ , ЕМ  $\Pi$ , КМ  $\Pi$ , СОС,  $\Gamma$ М  $\Pi$ , НД  $\Pi$ ,  $\prec$  V >,  $\square$  Ц  $\square$ ,  $\Sigma$   $\hookrightarrow$  3,  $\square$  Д  $\square$ ,  $\Gamma$   $\hookrightarrow$   $\hookrightarrow$ 

In the case of Z, N, M, parts only of each sign were used to fill out the sequences, while in the case of T, changes in form and position were necessary. Lastly, H was used with a diacritical mark.

$$Z, \lambda, \Lambda, N/\Lambda, M, \Lambda, \lambda, \Pi \triangleleft \Lambda, HHH$$

Such sequences of form and position of the same sign, corresponded tone for tone to the complete alphabetic sequences of the vocal notation. Otherwise, in the instrumental notation, those groups of semitones, corresponding in pitch-value to those notated in vocal notation by partial alphabetic sequences, were notated by groups of signs similarly made up of pairs of contiguous sequences. The accompanying diagrams will render this statement quite clear.





Though the tonic notation was devised for transcription of chromatic melodies, it was easily adapted for the notation also of

diatonic compositions. For this purpose, it was necessary only to combine certain parts of chromatic tetrachords to form diatonic sequences. This method may be illustrated by a diagram:



Moreover, it was possible by the notation to indicate at once in what genus, whether diatonic or chromatic, a melody was written. Thus, in the diatonic parts of the music of Ritual Hymn, A, whenever the note a occurs (fifteen times in all), it is rendered by I. Yet in the chromatic part, it is rendered once by I, ten times by K. The reason is that when the note is part of a chromatic sequence,—



it must be rendered by K, while in the diatonic, which has no sequences of consecutive semitones, this notation is impossible. Such is clear from the diagram:



When, therefore, in a chromatic passage, we find the symbol of a diatonic note, we detect a modulation:



In this phrase, for example, the change is from Dorian chromatic to Phrygian diatonic, and back again to Dorian chromatic.

Let us now expound the method by which we have transcribed our *corpus* of Greek music into modern notation.

We have no knowledge of the pitch-value of a single note in any of the scores. This fact, however, does not preclude an exact interpretation.

In the handbook of the musicographer Alypius is a diagram of the notation of the Aristoxenean Complete Scale in its fifteen transpositions. One of these, the Dorian, or standard Key, corresponded to the range of the average voice. Since we know the intervals of the scale, as described in the musicography, and further, that Aristoxenus accepted the principle of equal intonation, we can determine exactly the interval bounded by any two notes of a vocal score. Let us take the melody of the Aidin Epitaph.

The key in which the music is written is found by inspection of the diagram of Alypius, to be the Ionian. In the accompanying diagram, the signs — and — are here added, to denote respectively, tone and semitone.

$$W-H \circ 7-T-X \circ \Phi-C-0-K \circ I-Z-A \circ \Omega-\Theta-O'$$

The interval between C and Z is thus seen to be a fifth in ascending order, that between Z and K, a minor third in descending order, and so on. It is necessary only to assume a pitch-value for C, in order to transcribe the whole score.

In making this assumption, we have been guided by the statement of Aristides, that the Dorian Key comprises the tones within the range of the average voice. We assume, then, for the lowest tone of the lowest Key, the Hypodorian, a value of contrabass C. The range of the Dorian will then be that of the average baritone voice.



We may therefore assure ourselves of making but the least possible

transposition of the music out of the original key in which it was composed and sung.



Forgeries of Greek Music

Already in the post-classic period, attempts were made to palm off spurious antiques. Heraclides, an eccentric philosopher and bookworm, possessed of much knowledge and more conceit, wrote tragedies in the name of the dimly historical Thespis. Some lines of these tragedies are extant. As he was well informed on music and musicians of the Old Classic school, we may suppose that he was able to deceive some of his audience. Yet Spintharus, the father of Aristoxenus, finally exposed him for the liar and forger that he was.

We have seven forgeries of Greek music, written in the tonic notation, and composed at some time between the fourth and the twelfth centuries of our era, by persons quite unacquainted with the grounds and rules of Greek melodics and melodic composition. Of these, one is a melody to the opening lines of Pindar's First Pythian Ode, published by Father Athanasius Kircher in 1649. set to the opening lines of the Homeric Hymn to Demeter, was printed in 1724-6 by a noted Italian composer of church music, Benedetto Marcello. More famous, however, than either of these, are the four Hymns published in 1581 by Vincenzo Galilei, the father of the astronomer Galileo. These Hymns, addressed respectively to the Muse, to Calliope, to the Sun-God, and to Nemesis, were ascribed by Burette, in 1729, to Mesomedes, the court post of Hadrian. Since, however, Burette's evidence is most unacceptably inconclusive, we cannot admit the authorship of Mesomedes, and have therefore designated the author as Pseudo-Mesomedes, in recognition of the fact that the Hymns have been so long associated with the name of Mesomedes. Lastly, in a late manuscript of the Clouds of Aristophanes two lines of the

play are arranged with music notes, the interpretation of which renders the following absurd result:



The one characteristic feature of these spurious melodies which conclusively stamps them as forgeries, is their pentachordal structure.

We have observed that in the construction of all melody, the Greek composer was directed by the interval of the fourth,—or, in other words, the tetrachord was the bed-rock of melodic com-The unanimous testimony of scores and of musicography position. is to this effect, and establishes, as an inviolable rule, the close on the inferior dominant. There is not the slightest suggestion anywhere in the musicography, nor the least intimation in our scores of the Aidin Epitaph, the Ashmunen Orestes, and the two Ritual Hymns, that a close on the tonic was permissible under any circumstances. Yet in all of the forgeries under consideration,—excepting only the Pseudo-Aristophanes, which is not a melody at all, the structure is distinctly pentachordal, with the close on the tonic. We may illustrate this fact with the melody to Pseudo-Mesomedes' Hymn to the Muse:

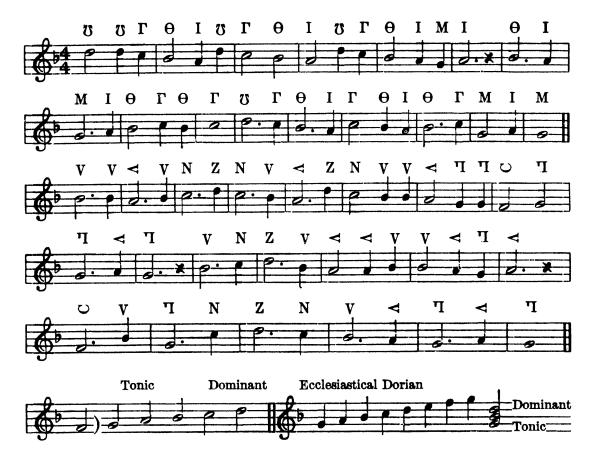


If now we place side by side, the closing phrases of the melody to the Aidin Epitaph, and one of the Dorian-Mixolydian passages of Ritual Hymn B, with those of the first three airs of Pseudo-Mesomedes, the fundamental difference between genuine and spurious Greek music will be clear:



There is also important evidence against these spurious melodies to be derived from examination of the notation. That is to say, the melodies of the Kircher-Pindar, the Marcello-Homer, and the Hymn to Nemesis, as well as the Pseudo-Aristophanes, are notated in a mixed notation, the characters of which are taken from both vocal and instrumental diagrams. In the case of the Marcello-Homer, we have two scores of the melody, the one notated in vocal, the other in instrumental signs. The melody of the Kircher-Pindar is transcribed in part by the vocal, in part by the instrumental signs. Yet the music to Pseudo-Mesomedes' Hymn to Nemesis, as we have it in the score, shows beyond a doubt that the composer was a mere forger of antiques, who knew the Greek notation only through the diagram of Alypius. In the eighteenth line of the Hymn, he once uses, instead of the vocal sign, the instrumental character. This was a natural error, since vocal and instrumental signs were written in the diagram in parallel columns. Our score truthfully records the false note, convicting the Pseudo-Mesomedes of forgery.

In the Kircher-Pindar, the case is even worse. Not only has the forger failed to observe the distinction between the two kinds of notation, but he has shown that he knew no more of the Greek language than he di dof Greek melodics. That is, he has made his melody to end, not only before he reached the close of a stanza, but in the middle of an unfinished sentence. This is shown by the score:



The pentachordal structure of this melody, with its close on the tonic, may be compared with the tetrachordal structure of one of the Dorian melodies in Ritual Hymn A.



As the latter is in the Greek Dorian, with the required close on the inferior dominant, the melody of the Kircher-Pindar is in the ecclesiastical Dorian, having a tonic close.



The Interpretation of Greek Music

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# THE INTERPRETATION OF GREEK MUSIC

## I. Intonation in General

Inadequacy of our Theory. To whoever may desire to understand the music of ancient Greece, I would recommend that he put away from his mind that sense of superiority which our progress in counterpoint, harmony, form and orchestration has engendered, and devote his attention to the shortcomings of our music, for they relate to those very matters concerning which Greek music has the most to teach us.

Our music has come down to us from remote ages through the Greek system. The first stage in its progress was marked by the collection of a multiplicity of Harmonies and modes, not unlike those upon which the classical music of India is based. Of the diatonic scales, some were soft, employing septimal or soft intervals, and others were hard, employing semitones, and major and minor tones, differing among themselves in the order in which these intervals were strung together. The Greeks may have added to this collection. Their chief contributions to musical progress, however, were instrumental heterophony and the science of intervals. They were driven to the use of the former by the tyranny of the 'metrici.' Thus the long and short of Greek poetry led indirectly to the harmonic system of music, which is one of the main achievements of European civilisation. The foundations of musical science were laid by Pythagoras. The results of his labours were soon apparent in the classification of the enormous number of scales in use, the adoption of a musical notation based upon an intricate system of correlated keys, and the art of modulation. In the break-up of Roman and Greek civilisation, the subtle distinctions between the various Harmonies were the first features of the music to go under. Curiously enough, the innovations introduced by the master minds of Greece survived in the art of modulation, and the contrapuntal tradition. A new series of keys was invented. This degenerated, under the growing influence of keyed instruments, and the craze for unlimited modulation, into the musical freak of equal temperament. in which a scale, grotesquely out of focus, is set up as a standard and basis of theory. Players on the pianoforte and organ perform tempered music in tempered tones to admiring audiences. Orchestras are given tempered music to play, and are expected to find out for themselves without the guidance of an adequate theory, how to bring it into focus. Naturally enough, the Pythagorean or ditonal scale, which employs major tones only, and is for that reason the nearest thing in the hard diatonic to equal temperament, has an immense vogue. It is perhaps the ugliest scale that was ever put together. The Indians and Greeks combined a ditonal tetrachord, for the sake of the contrast, with some other form of diatonic. There is no evidence <sup>1</sup> that they ever sang or played, as we do, in the ditonal scale. I think that we too would tire of it if it were not wrapped up in various ways and disguised by much modulation.

The theory, notation and terminology of temperament are unequal to the task of interpreting the Greek keys and describing the Greek Harmonies. I propose to name the intervals with which real music is concerned in the simplest terms possible, and to make slight alterations in the accidentals of the staff notation. The theory of real music, treated from the standpoint of the musician, is a new science.

Intervals. Of the names of intervals in the following table, some are new, such as those which include the appellation 'soft,' and the terms used to differentiate the varieties of the semitone. I have seen the terms false fifth and false fourth applied, quite unnecessarily, to the diminished fifth and augmented fourth. As I use them, they point out a vital distinction. The 'soft' intervals are derived from septimal harmony, that is, directly or indirectly, from the seventh partial tone. The others can all be got from different combinations of the first six partial tones and the intervals formed by them. Thus the fourth from the fifth gives the major tone  $\left(\frac{3}{2} \div \frac{4}{3} = \frac{9}{8}\right)$ . The fourth less the major third is the semitone  $\left(\frac{4}{3} \div \frac{5}{4} = \frac{16}{15}\right)$ . The major tone less the semitone is the residual semitone  $(\frac{9}{8} \div \frac{16}{15} = \frac{135}{128})$ . The major third less the major tone is the minor tone  $(\frac{5}{4} \div \frac{9}{8} = \frac{10}{9})$ ; and the minor tone less the semitone is the small residual semitone  $\left(\frac{10}{9} \div \frac{16}{15} = \frac{25}{24}\right)$ . The rough minor third, one of the most important intervals in music, contains a minor tone and a semitone  $\left(\frac{10}{9} \times \frac{16}{15} = \frac{32}{27}\right)$ . If the major tone be subtracted from it, the diminished semitone or  $\lambda \epsilon \hat{\imath} \mu \mu a$  will result  $\left(\frac{32}{27} \div \frac{9}{8} = \frac{256}{243}\right)$ .

<sup>&</sup>lt;sup>1</sup> The use of the ditonal numbers for the notes of the Lydian key, by late and ignorant authors (such as 'Anonymus'), is no evidence, in my opinion. Want of

space prevents my doing more than presenting a bald outline of the views I hold regarding the history of music.

Interval.	Ratio.	Content in cents to the nearest integer.	Interval.	Ratio.	Content in cents to the nearest integer.
1. Fifth	$\frac{3}{2}$	702	13. Soft tone	$\frac{8}{7}$	231
2. False fifth	$\frac{40}{27}$	680	14. Major tone	$\frac{9}{8}$	204
3. Diminished fifth	$\frac{64}{45}$	610	15. Minor tone	$\frac{10}{9}$	182
4. Augmented fourth .	$\frac{45}{32}$	590	16. Semitone	$\frac{16}{15}$	112
5. False fourth	$\frac{27}{20}$	520	17. Residual semitone .	$\frac{135}{128}$	92
6. Fourth		498	18. Diminished semitone.	$\begin{array}{c} 256 \\ \hline 243 \end{array}$	90
7. Soft ditone	$\begin{array}{c c} 4\\ \overline{3}\\ 9\\ \overline{7} \end{array}$	435	19. Soft semitone	$\frac{21}{20}$	85
<sup>2</sup> 8. Ditone	$\begin{array}{c} 81 \\ \overline{64} \end{array}$	408	20. Small residual semitone	$\frac{25}{24}$	70
9. Major third	5 4	386	21. Small soft semitone .	$\frac{28}{27}$	63
10. Minor third	$\frac{1}{6}$	316		41	
11. Rough minor third .	32 27	294			
12. Soft minor third .	7 6	267	·		

TABLE OF INTERVALS FROM THE FIFTH TO THE SEMITONE

To these may be added the *simple quarter-tone* or comma  $(\frac{81}{80}$ ; cents 22).

This interval results when the minor tone is subtracted from the major tone, or the rough minor third from the minor third, or the diminished semitone from the semitone. There are other varieties of 'quarter-tone,' but their importance is not such as to demand a special terminology. The quarter-tone in general may be defined as the remainder when one variety of semitone is subtracted from another. I propose also to use the term *enharmonic* in a special sense. If two notes differ in pitch by a simple quarter-tone I shall call the lower note the 'enharmonic' of the higher note. Thus, if the upper note in the interval of the fifth be replaced by its enharmonic, the false fifth will result.

Accidentals: Hard. I take  $c \ as$  the enharmonic of  $c \ as$  the enharmonic of  $c \ as$  the enharmonic of  $c \ as$ . I distinguish the sharps in the same manner, using the signs  $\ as$ ,  $\ as$ , and for the flats I take  $\ as$ ,  $\ as$  and  $\ b$ . In the matter of tuning, pitch C will be  $\ c'' \ as$ . The table which follows shows how the notes are connected by strings of just fifths; separate signs for the different octaves are omitted, being unnecessary.

<sup>&</sup>lt;sup>2</sup> Intervals 7 to 9 are all varieties of the major third.

#### Enharmonic Progression

1st string.	2nd string.	3rd string	4th string.
a #	а #		
d <b>‡</b>	d #		
g <b>‡</b>	g #		
c #	c #		
f #	f #	f #	
	b <b>\</b>	ьä	
	e 🕽	е 📮	
	а	а 🗖	
	d <b>\</b>	d 🕽	
	g <b>\</b>	g	g
	c 🕽	с Ц	с Ц
	f 🕽	f 📮	f 🛱
	b <b>.</b>	b <b>þ</b>	ь <b>b</b>
	e 😓	e 😓	e <b>b</b>
	a 😓	a 😓	a b
		d þ	d <b>b</b>
		g 😓	gb
		c b	c b
		f þ	f b

The ditonal scale, being built up from fifths only, will take its notes from one and the same string. Hence notes of the same string will give the following intervals,—the fifth, fourth, ditone, rough minor third, major tone, diminished semitone. If the semitone or minor third above a given note be required, it will be found in the next higher string; the major third will be found in the next lower string. The note which is a minor tone above a given note also belongs to the next lower string. It may be observed that the low sharps (\$\pm\$) belong to the first string, the low naturals (\$\pm\$) to the second, and the low flats (4) to the third; the ordinary sharps (#) belong to the second, the ordinary naturals (1) to the third, and the ordinary flats (b) to the fourth. We can manage to dispense with high flats, but will on some rare occasions require three extra low flats (1). I think the following progression by semitones is worth the space it occupies, as it is easily memorised, and when grasped makes the whole system clear. The skhismatic progression is indispensable. The skhisma is the difference (approximately 2 cents) between the major third, and the nearest approach to that interval to be got from a string of fifths.

$$386 - (5 \times 1200 - 8 \times 702) = 386 - 384 = 2$$
.

PROGRESSION	BY	THE	$\mathbf{J}_{\mathbf{UST}}$	SEMITONE	$\left(\frac{16}{15}\right)$	3
-------------	----	-----	-----------------------------	----------	------------------------------	---

	St	rings	
1.	2.	3.	4.
		f #	g 🛱
	а #	b	c 🕽
	d #	е Ц	f
	g #	а 📮	b <b>b</b>
	c #	d 🕽	e <b>þ</b>
	f #	g 📮	a þ
a #	b <b>\</b>	c 📮	d þ
d #	е 🕽	f 📮	g <b>b</b>
g #	a <b>b</b>	b <b>5</b> .	c b
c #	d <b>\</b>	e 😓	f b
f #	g <b>\</b>	a 😓	
	c <b>t</b>	d <b>þ</b> .	
	f 🕽	g 😓	
	b <b>.</b>	c <b>þ</b> .	
	e 🏚	f 😓	

### PROGRESSION BY THE SKHISMA

String.		
1.		a# d# g#
. 0	44 44 4 4 4 4 4 4 4 6 4 6	
<b>Z.</b>	att ott att ett itt of	et at dt gt ct ft bbeebab
3. f# bb еb аb db gb cb fb	bb eb ab db gb cb	fb
4. gb cb fb	- A - A - A - A - A - A	- <b>-</b>
4. gp cv iv		

The last table teaches us that, for all practical purposes, a high sharp is equivalent to an ordinary flat, an ordinary sharp to a low flat, and a low sharp to an extra low flat.

Accidentals: Soft. The hard minor seventh, a discordant interval, such as  $c \mid to b \mid b$ , or  $g \mid to f \mid b$ , is the octave less the major tone  $(\frac{2}{1} \div \frac{9}{8} = \frac{16}{9};$  cents 996). When this interval is flattened to a certain point, it is resolved into a rich soft semi-consonance, without beats, the soft minor seventh,  $\frac{7}{4}$ , cents 969. In the notation, we shall mark the relationship between these intervals by a similarity of sign, and draw attention to the septimal origin of the soft minor seventh by using the figure 7. The soft counterpart of  $b \mid b$  will be  $b \mid b$ , 7,

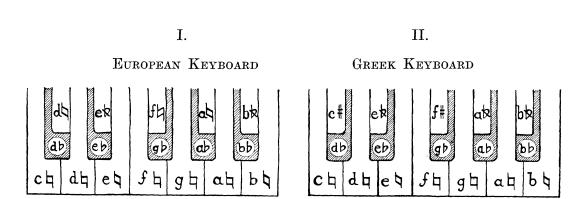
<sup>&</sup>lt;sup>3</sup> A low sharp is here followed by a low natural, a low natural by a low flat, and so on. If both are naturals or flats, the lower

note takes the lower variety of accidental. The varieties of hard diatonic are therefore easily described.

of b b, b b 7, of d b, d b 7, of f  $\sharp$ , f  $\sharp$ 7. In the chord of the seventh g b b d b f b, the root, fifth and seventh belong to the same string. It is therefore a matter of extreme simplicity to discover a note which is a soft tone below, or a soft minor third above a given note. For example, a b 7 is a soft minor third above f b, and d b 7 a soft minor third above b b.

Suggestions for a Keyboard. The niceties of intonation with which we have to deal need not arouse any misgiving. One need not have a phenomenally good ear to learn to detect major tones, minor tones and soft intervals. I have known an uneducated Indian girl pick up in a very short time the soft intervals of some of the rarer Indian  $r\bar{a}gas$ , and sing them with accuracy and without the slightest hesitation. When a European audience rewards a singer or soloist on the violin or 'cello with rapturous applause because of the exquisite feeling he has shown, the secret of his success is to be discovered in the felicity with which he has (perhaps unconsciously) managed his quartertones and other intonational nuances.<sup>4</sup> Gifted musicians constantly employ these shades of meaning. My own limited experience further leads me to the opinion that the more highly educated and trained the performer the less sense of harmony does he exhibit.

The best way to train the ear to detect real intervals is to have an American organ constructed with seventeen notes to the octave, to arrange suitable music for it, and to familiarise one's self with different scales. I suggest the following keyboards and tuning, the one on the left for European music, and the one on the right to render the extant specimens of Greek music accurately intoned.



The extra keys may be coloured red; they should be raised above the black keys and should be placed sufficiently far back to allow of easy access to the black keys. It is possible to place seventeen vibrators with their action side by side without widening the octave unduly. These keyboards will present no great difficulty to the player.

<sup>&</sup>lt;sup>4</sup> I have often heard really musical soloists jodeling for two voices, I have heard it in indulge in septimal harmony. In Swiss the lower part.

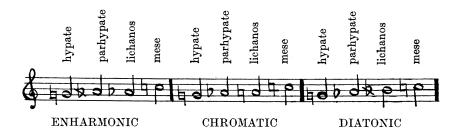
### TUNING METHOD (WITHOUT BEATS)

		I.		II.
Fifths from c \	(1) up	д Ц−d Ц−а Ц.	(1) up	g <b>\_</b> -d <b>\_</b> -a <b>\</b> .
	(2) down	f <b>□</b> -b <b>♭</b> -e <b>♭</b> .	(2) down	f 1-b 2-e 2-a 2.
Major thirds from c	(1) up	e <b>\b</b> .	(1) up	e <b>\( \)</b> .
	(2) down	ab.	(2) down	a <i>b</i> .
Fifths from a $b$	(1) up	e b−b b−f ♯.	(1) up	e <i>b</i> −b <i>b</i> .
	(2) down	d ♭-g ♭.	(2) down	d <i>b</i> −g <i>b</i> .
Fifths from e	(1) up	b <b>\b</b> .	up	b <b>\</b> − <b>f #</b> − <b>c #</b> .
,	(2) down	a <b>\( -</b> d \( \bar).	-	

The owner should learn to tune the instrument himself. Vibrators will not keep in tune for long; and in real music everything depends upon accuracy.

#### II. GREEK INTONATION

Preliminary. No one can tackle the Greek notation with any chance of success unless he makes a preparatory study of the structure of scales. Pythagoras was the father of this branch of science. Other philosophers could devise no better method than to lump together all the scales they knew and guess what equal division of the octave might produce all the notes required. This method was followed in ancient India. The number guessed was 22. The octave was conceived of as consisting of 22 srutis, of which 4 went to the major tone, 3 to the minor tone and 2 to the just semitone. I mention this fact as I find the sruti figures convenient for the brief description of true diatonic scales. In Greece, musical philosophers thought the tetrachord the most useful instrument for the classification of scales.<sup>5</sup> They divided their tetrachords into three genera, the enharmonic, chromatic and diatonic. Aristoxenos was a prolific writer who has been extensively quoted by later authors. He scorned the application of numbers to music.6 He preferred his own slipshod method of guesswork. Like the rest of the Greeks he thought in terms of the E mode. In order that what he says on the subject of the three genera may be better understood, I give the typical tetrachords in staff notation-



<sup>&</sup>lt;sup>5</sup> A scale might take tetrachord X followed by tetrachord Y. Thus two tetrachords might explain four scales, namely,

xx, yy, xy, yx.

<sup>&</sup>lt;sup>6</sup> Dr. Macran's Harmonics of Aristoxenos, Oxford, 1902, p. 189.

The two intervals between the hypate and the lichanos were termed the pyknon; the hypate was the barypyknos, the parhypate the mesopyknos, and the lichanos the oxypyknos. The hypate and mese were φθόγγοι έστῶτες or invariable tones and the parhypate and lichanos κινούμενοι, that is of course having regard to the construction of tetrachords. Aristoxenos gives one species of enharmonic, three chromatic, namely syntono-, hemiolio-, and malako-chromatic, and two diatonic, the soft, malako-diatonic, and the hard, syntono-diatonic. He tells us that the enharmonic pyknon contains two He estimates elsewhere that the enharmonic diesis enharmonic dieses. amounts to one fourth of the difference between the fifth and fourth.<sup>7</sup> enharmonic pyknon gives a lichanos a half tone above the hypate. describes no other enharmonic tetrachord. He lays down that the lowest chromatic lichanos is one-sixth of a tone higher than the enharmonic. also informs us that the tendency in his time was to degrade the enharmonic into a variety of the chromatic by widening the pyknon (Harmonic, i. 25). Ptolemy (Harmonic, i. 14) describes a number of tetrachords by relative string In such a scale, melody would naturally fall into some such figure as g \( \bar{b} \), a \( \bar{b} \), c  $\[ \]$ , a  $\[ \]$ , 7, g  $\[ \]$ , the intervals being semitone  $\binom{16}{15}$ , major third  $\binom{5}{4}$ , soft ditone

 $\left(\frac{9}{7}\right)$  small soft semitone  $\left(\frac{27}{28}\right)$ . I have not space to discuss the rest of Ptolemy's scales. The inference to be drawn is that the enharmonic *pyknon* consisted of two intervals, semitone, quarter-tone, in that order, amounting together to a just semitone; the chromatic contained two semitones, and the diatonic a semitone followed by a tone.

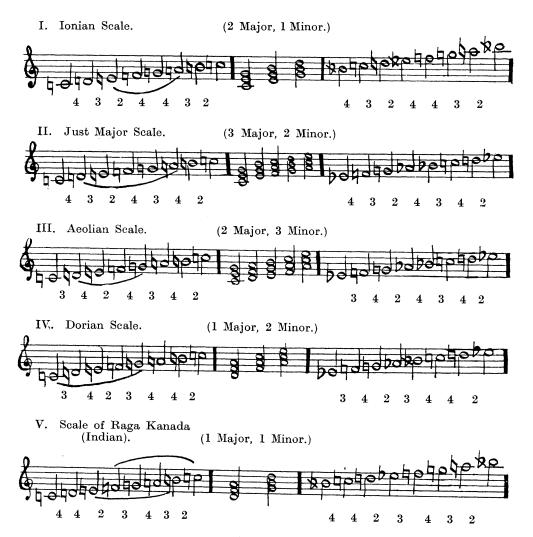
The Diatonic falls into two broad classes, the soft, which employs septimal harmony, and the hard. The latter includes the ditonal and the True Diatonic. The True Diatonic is made up of three major tones, two minor tones and two just semitones. There are five varieties in common use in our own music. They were also contained in the Greek system of keys, as I shall show. Other forms of true diatonic scale are possible. As we think mostly in terms of the major scale, I give the five scales in that form. In order that the scales may be the better compared on the first of the two organs above described, I give two examples of each. The position of the false fourth or fifth, which is an important factor in the harmony, is shown by brackets, and the *sruti* figures are given below each scale.

<sup>&</sup>lt;sup>7</sup> This is the major tone. The diesis of Aristoxenos was a conception of no practical value.

<sup>&</sup>lt;sup>8</sup> According to the classification herein followed. 'Quarter-tone' is here used in its general sense.

#### TRUE DIATONIC SCALES

#### Common Chords



In our music, diatonic passages of any length rarely remain faithful to one form of scale. Enharmonic changes are the rule rather than the exception. An example of Scale I is the opening theme of Tschaikowsky's Seasons—July; of Scale II, the first theme of Beethoven's Pastoral Symphony; of Scale III, the main theme of the Andante from the fifth Symphony. Our Minor (descending melodic form) is generally in Scale III. IV and V are found in passing modulations, more especially the former. The fifth Symphony of Beethoven—first phrase in octaves—seems to me, as played, very like No. V, A mode.

I conclude this subsection with a note on the subject of modes. The C mode may be taken in Scales I, II, or III. IV is used when a passing modulation is made into the supertonic minor. I and IV suit the D mode, both fourth and fifth coming out true, but I is preferable as IV gives what is very little else than a variety of the minor mode. The oriental D mode is almost always in Scale I.

The E mode may be taken in II, III, or IV; its ethos varies from sweetness to strength in that order. The same remark applies to the A mode which may be taken in Scales II, III, IV, or V. Scale V gives an extremely rugged and manly scale, very popular in India. The G mode is best in Scale I, and the F mode in Scale II. The B mode is merely a variety of the E mode, and need not be discussed separately. In harmonising the modes, if he wishes to preserve their purity, the student must avoid spurious concords. No common chord which contains either a false fifth, or a ditone, or a rough minor third, is permissible. The ditone may be replaced chromatically by the minor third, the rough minor third may be replaced chromatically by the major third, or, in suitable positions, the third of the chord may be omitted. The ditone, or rough minor third, or the corresponding sixths, may occur between passing notes.

The Introduction of Alypius. The Introduction of Alypius is the only comprehensive guide to the Greek notation extant. It is a fragment of uncertain date. It purports to exhibit the whole range of keys, that is to say fifteen, in the diatonic and chromatic genera, and six and part of three others in the enharmonic. In the first key, the Lydian, in the chromatic genus, four of the notes which mark the distinction between that genus and the diatonic are crossed out.

The first thing to notice is that the enharmonic, whenever exhibited, is identical with the chromatic. The second is that all the keys in all the genera follow the terminology of the E mode. It is the pyknon from the hypate to the lichanos in the E mode tetrachord which is changed to mark the genus. Nevertheless, the parhypate suffers no change in passing from one genus to another. Alypius has therefore not only confounded the chromatic with the enharmonic, but has likewise, in his enharmonic keys, confounded the parhypate with the lichanos.

Bellermann worked out the order of tones and half tones in the diatonic keys. The question which is still unanswered is—what was the order of major and minor tones? The amazing opinion of Bellermann and Westphal that the Greeks were well acquainted with equal temperament is based upon no evidence beyond a stupid passage from that unscientific writer, Aristoxenos. As regards pitch, Bellermann makes the Lydian key start from D. I prefer C, as it simplifies the notation, and gives a much more comfortable compass to the extant compositions.

The keys are in what was known as the Greater Complete System. The section called the *synemmenon*, which I have enclosed in brackets, served as a modulatory bridge between each key and the next. The Hypolydian key and all the keys between the Lydian and Hyperdorian are of the same pattern. The *paranete synemmenon* and *trite diezeugmenon* in these keys are distinguished by different signs, although, at first sight, they seem to stand for the same note. Herein lies the clue to the Harmony. No other scale will fit into the scheme except Scale IV. When that scale is applied to the keys named, the whole notation of the diatonic stands revealed.

<sup>&</sup>lt;sup>9</sup> See the remarks of Aristoxenos above 10 Macran, p. 207. quoted.

### THE DIATONIC KEYS

Lydian—Scale IV—





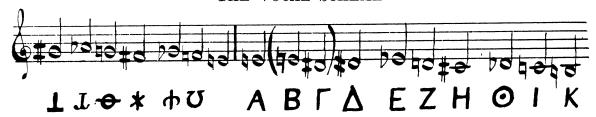


The notation ignores the skhisma. No question of temperament is involved, as the Greeks never constructed an instrument to take the whole system of keys. Indeed, some of the keys were never used. I have made the necessary transposition at the most convenient point.

The rest of the keys contain four new signs:-

mental sign of the third of these as L. Aristides Quintilianus (Meibom. p. 21) uses  $\Im$ , which appears, from the instrumental scheme below, to be correct. An examination of the remaining chromatic keys on the lines already indicated easily establishes  $\vee$  and  $\wedge$  to be a  $(skhismatic b \nmid )$  and  $\vee$  and  $\Delta$ to be d \(\frac{1}{4}\) (skhismatic e \(\frac{1}{4}\)). In the Lydian and Hypolydian enharmonic keys, Alypius takes e and b as enharmonics of e and b respectively. He is followed in this by Aristides Quintilianus. The three manuscript hymns, in most recensions, use et as enharmonic to eb. Some recensions of the hymns to Helios and Nemesis, however, give A, which may be meant for  $\Delta$  (e  $\d$ ). In the instrumental notes to the song from *Orestes*,  $\d$  (corresponding to the vocal  $\forall$  or  $e \downarrow ($ ) again appears. From the context, it is evidently a wrong note, being intended for e + (Y). I think there is good reason to hold that the frame of the instrumental scheme (which see below) led the ignorant to suppose wrongly that e 😓 and b 😓 were the correct enharmonics of eb and bb.

The truth of my interpretation is established not only by the versions it presents of the old Greek compositions but by the extraordinarily ingenious alphabetical arrangements here set forth:—







### THE INSTRUMENTAL SCHEME

(Sharps skhismatically changed into flats.)







It is evident from the instrumental scheme that the fully developed kithara was tuned to the ditonal scale. This was undoubtedly one of the many innovations brought in by the Pythagoreans. To them also must be awarded the credit for inventing the notation, and not to Aristoxenos. The bar of the kithara enabled the player to tighten the strings by any interval up to a full semitone. In India, the bina, which is the principal instrument, is tuned to a collection of notes based not upon any favourite scale, but upon considerations of convenience. The nuances, which transform the fret notes into the required scale, are obtained by pressing hard upon the wire or drawing it to one side. The Pythagorean method was similar; the bar gave any note required. The adoption of the relative string lengths of the ditonal scale for the intervals of the Lydian key by late and ignorant authors, such as Anonymus <sup>11</sup> and Aristides Quintilianus, is therefore no longer a mystery, and the assertion that Greek music was founded upon the ditonal scale stands refuted.

Other Notational Signs. The Epitaph of Seikelos, an inscription discovered by Sir W. M. Ramsay at Tralles, and the papyrus fragment containing a chorus from Orestes (lines 338 to 343) bear rhythmic signs. The length of the notes is shown by marks placed above them, - for a note of two time-units and \_ for one of three. A note upon which the beat comes bears a dot. In the chorus, a distinction is drawn between beats, one kind being denoted by a dot above the note, and the other by a dot at one side. I assume that the former method marks the main stress, and the latter a subsidiary stress. The epitaph makes use of the following additional signs (1) - as in I K, and (2) X as in CX7. These are dealt with in Anonymus de Musica. Bellermann takes x to mean staccato, x to mean quasi-staccato, and  $\smile$  to mean legato.  $\smile$  is there applied to different notes, while the other two signs are also applied to repetitions of the same note. From this, and judging by the peculiarities of oriental music in general, I think it is more likely that - stood for portando or the glide, X for the 'leap,' that is for the absence of glide, and X for staccato. The staccato sign was sometimes written thus,  $\chi$ .

#### III. Scales, Harmonies and Modes

The Greeks employed three different methods of representing scales. In discussing the structure of scales, as we have seen, they made use of the tetrachord. In exhibiting the modes of a Harmony, they adopted the full octave (Ptolemy, Harmonic i. 16, ii. 14). It was also customary to show the tessitura of a composition by stringing together the actual notes contained. This method was probably the most ancient, as the further back one goes in the history of music, the more importance seems to be attached to matters of compass. The Dorian, for example, was in early times only allowed to descend a tone below the hypate. I think it very likely that this circumstance led the Church to suppose that the Dorian was a D mode. To illustrate my meaning, I give a few compass scales.

<sup>&</sup>lt;sup>11</sup> Anonymus de Musica, edited by Bellermann (Berlin, 1841).

# ARISTIDES QUINTILIANUS







# OTHER SCALES





<sup>\*</sup> The Lydian and Ionian appear to be misnamed. There are also mistakes in the notation.

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As regards the genera, we may acquire some further knowledge from the Greek compositions. The enharmonic or chromatic sometimes formed the sole basis of a composition. The enharmonic genus was much favoured in the strict classical school represented by the agon of Delphi. The enharmonics were frequently omitted, leaving a pentatonic scale as in the opening of the long hymn to Apollo. The enharmonic genus was often mixed with the diatonic as in other passages in the same hymn, and in the chorus from Orestes. A sparing use of the genus was also made in compositions in diatonic scales. This will be observed in each of the three manuscript hymns. The enharmonic seems to have been employed, like the chromatic chord of modern times to add piquancy to the music. The manner of its employment is well-deserving of study. The phrase eb, dt, eb, bb, ab, gt, bb in the hymn to Calliope provides a beautiful climax to the melody. We have many such instances in our own music, but no one except the naturally gifted musician pays any attention to them. The following excerpt from the 'haunting' melody in the Unfinished Symphony is given in two renderings, A and B:-



In the passage marked a b,  $g \not\equiv a \$  is followed first by  $e \$ , which, being a just fourth below  $a \$ , leaves no doubt as to the intonation, and then by the enharmonically raised pair  $g \not\equiv a$ . Similarly, in the hymn to Calliope,  $e \not\models a$  is separated by one note  $a \not\equiv a$  from its enharmonic  $a \not\equiv a$ , and the changed intonation is emphasised by a leap to  $a \not\equiv a$ . Schubert, needless to say, was neither a victim of the temperament habit, nor of the ditonal habit. A is therefore what he intended, and it is in the best Greek manner. I heard a small and well-trained French orchestra play the symphony. The 'cellos, who were led on that occasion by a celebrated soloist, played as in A. The violins replied with B. The next day in answer to my questions, the conductor said he had noticed the difference. The rendering of the 'cellos made certain notes flat. The rendering of the violins was plus juste, by which he meant, as he admitted, more in tune with the piano! Rendering B, to my mind, degrades the music into a kind of musical pun. And that is the rendering which is generally given. The surviving examples of Greek music throw very little light upon

the treatment of chromatic scales. There are interesting passages in the first of the mural hymns in which the chromatic, diatonic and enharmonic are all used together. The hymn to Calliope also employs a chromatic note. The orthodox Greek chromatic genus is still to be found in India in the Karnatic  $r\bar{a}ga$  Kanakangi amongst others. It is not, however, an interesting scale. Most of the Greek chromatic scales must have been compounded of mixed chromatic and diatonic tetrachords. Finally, to revert to the enharmonic genus, melodies in purely enharmonic scales would be much appreciated by the musical experts of India or Persia, at the present day. The best Indian singers make a lavish use of enharmonic changes. To the European, the singer appears to attack his notes in a slovenly way, beginning a little sharp or flat and sliding on to the correct pitch. That style of singing is strongly suggested by the chorus from Orestes.

The Harmonies and Modes. The modal scale, as used by Ptolemy, and by European musicians, takes no count of the compass of a composition. In the Greek system it stretched downwards for the space of an octave, either from the nete diezeugmenon, or from the mese; we take our scales from tonic to tonic. Aristotle compares the mese to the conjunction in speech, because it frequently recurs, and links the other notes together.<sup>12</sup> The mese, in that view, was the predominant note of the melody, or more briefly, the predominant.<sup>13</sup> The hypate was the final, upon which the voice came to rest naturally, and without effort.<sup>14</sup> These remarks will be found to apply most aptly to all the compositions except the last two manuscript hymns. Those hymns, to Helios and Nemesis, make the hypate 15 the predominant, and the mese the final. This brings us to the important distinction embodied later In the Byzantine period they were on in the terms authentic and plagal. known as είδος ἀτελές, ending on the hypate (i. e. authentic), and είδος τέλειον (or plagal), ending on the mese. 16 In the authentic mode, therefore, the predominant was a fourth above the final; in the plagal mode it was a fifth above. A further corollary to be drawn is that every complete parent scale had the latent capacity of producing fourteen modes.

The old Harmonies of Greece can best be discussed in the diatonic form. In Athenaeus 14. 624 is a fragment from Heraclides Ponticus in which the following passage occurs: 'The term  $\dot{a}\rho\mu\nu\nu\dot{a}$  should not be applied to the Phrygian or Lydian scales; there are three Harmonies, as there are three tribes of Hellenes—Dorians, Aeolians, Ionians. . . . We must conceive a very low opinion of theorists who fail to detect differences of species, while they keep pace with every variation of pitch. . . .' The passage describes the *ethos* of the three Harmonies, and states that, in the author's time, the Aeolian was known as the Hypodorian, being below the Dorian on the *aulos*. Aristoxenus <sup>17</sup> describes the scale-system in question thus: 'Others again, looking to the holes of the *aulos*, separate the three lowest keys, the

<sup>&</sup>lt;sup>12</sup> *Prob.* xix. 20. See also *Prob.* 36.

<sup>&</sup>lt;sup>13</sup> This term is preferred to 'dominant,' being free from ambiguity.

<sup>&</sup>lt;sup>14</sup> Prob. xix. 334.

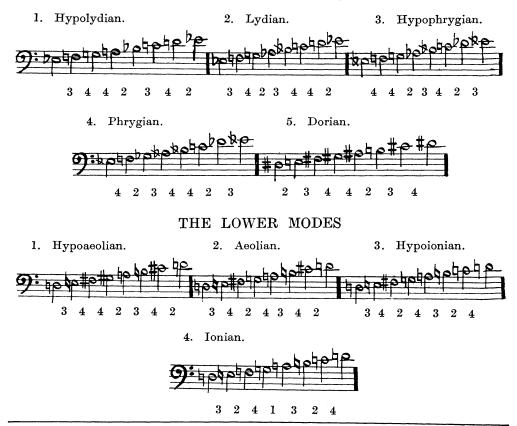
<sup>15</sup> Or the nete.

<sup>&</sup>lt;sup>16</sup> Bryennios (circ. 1400 A.D.) John Wallis, Opera Math. iii. 259. Oxon. 1699.

<sup>&</sup>lt;sup>17</sup> Meibom. p. 37; Macran, 128. 193.

Hypophrygian, Hypodorian, and Dorian by an interval of three-fourths of a tone. . . .' There is no reason therefore to connect the Aeolian with the Hypodorian of later times. 18 We can identify the harmony with certainty from another source. The 'Introduction' formerly attributed to Euclid (Meibom. 20. 1) contains this passage, descriptive of the keys: 'Two Lydian keys, a higher, and a lower also called Aeolian; two Phrygian, one low also called Ionian, and one high; one Dorian; two Hypolydian, a higher, and a lower, also called Hypoaeolian; two Hypophrygian, of which the lower is also called Hypoionian.' This description accurately corresponds to the keys of Alypius, if we omit the Hypodorian and the high keys (Hyperlydian, etc.), three of which are merely low keys transposed an octave higher. The modes which formed the nucleus of the keys are at once apparent if we take octave scales upwards from either R (e  $\flat$ ) or  $\Omega$  (e  $\flat$ ) in the 'higher' keys, and  $\Gamma(d \ )$  in the 'lower' keys. 19 The instrumental notes involved in this collection of scales include eight of the groups of three, beginning respectively with the letters  $\Gamma V F C K \Gamma < \Gamma$  and finishing up with one note N. I give below the resulting modal scales:-

#### THE HIGHER MODES



<sup>&</sup>lt;sup>18</sup> Heraclides was a pupil of Plato.

are, in that sense, functional names. Each mode, however, had its own mese, the mese of position. This is clear from Ptolemy's scales, and from other indications.

<sup>&</sup>lt;sup>19</sup> As the notes are named by Alypius the *mese* is always the base of a Dorian tetrachord. The names have regard to the theoretical structure of the keys. They

The first batch are in one Harmony, Scale IV. That can be no other than the national scale par excellence, the Dorian. If the lower keys of Alypius be examined it will be found that they form a kind of patchwork cementing the whole structure. Two of them, the Aeolian and Ionian, are in distinctive Harmonies to which the others are merely introductory. Their titles are sufficient to proclaim that they are the two other famous Harmonies, which, with the Dorian, represented the three tribes of Hellenes. The Dorian was therefore an E mode, the Aeolian a C mode, and the Ionian a D mode. The symmetry of these scales is apparent when one describes them in sruti figures with the point of conjunction emphasised.

$$234 - 4 - 234$$
;  $342 - 4 - 342$ ;  $324 - 4 - 324$ .

Let me add that our Harmonies are the major and minor (descending melodic form). The former is supposed to be the just major (Scale II.), and the latter is the Aeolian, A mode. It is quite a mistake to think of the minor as the A mode of the major. This is only so, speaking generally, in equal temperament or the ditonal. As Mr. J. Curtis points out,<sup>20</sup> the Pythagoreans persuaded the theatre to accept the whole range of Dorian modes. In this way the  $\tau \rho \delta \pi \sigma_S$  came into existence. The school founded by Pythagoras performed inestimable services to the art of music, but this innovation was a severe blow to the old national Harmonies, and was strongly resented by men of taste. The Lydian τρόπος was a poor substitute for the Aeolian. The Phrygian was a scale of extreme austerity. This may be realised from the Hymn to Nemesis. The more pleasing of the Dorian τρόποι were the Dorian, Mixolydian, and Hypodorian,<sup>21</sup> as these were most suited to the Harmony. Among the Greeks, as the above quotation from Heraclides shows, the conceptions mode and Harmony were not clearly differentiated. It is not surprising therefore to find that many Greek writers used the terms άρμονία and  $\tau \rho \acute{o} \pi o \varsigma$  without discrimination. The distinction was that the  $\tau \rho \acute{o} \pi o \iota$ of any parent-scale differed, as regards intervals, in starting point only; they were octave scales cut out in different places from the same string of intervals. The Harmonies, on the other hand, were taken from different strings; their major and minor tones were arranged in a different order.

I add the following note upon the surviving examples of Greek music. The first mural hymn makes use of the Dorian mode in two forms, one in Dorian Harmony, commencing in the pentatonic form, the other in Aeolian Harmony. The latter on its second appearance is highly ornamented chromatically and enharmonically. The second mural hymn, in the instrumental notation, employs the Dorian and Hypodorian modes of Dorian Harmony. The Epitaph is in the Ionian, hexatonic form. The chorus from Orestes is in the Dorian with enharmonic embellishment. The three manuscript hymns are masterpieces. The way the cadences are managed and tonality maintained is most artistic. The hymn to Calliope is in a free form of the Dorian, employing a chromatic note and descending a fourth below the hypate. The hymn to Helios or Apollo is in the Mixolydian, and that to

<sup>&</sup>lt;sup>20</sup> J. H. S., XXXIII (1913), p. 35.

Nemesis in the Phrygian. It will be observed that the last two modes are clearly plagal. We may conclude that the Mixolydian was a plagal B mode somewhat resembling the Dorian, employing the chief cadences in the form a b, g \(\beta\), g \(\beta\) being the mese, that it made use of the high d \(\beta\) frequently, this fact imparting to it the shrill flavour for which it was noted, and that it revelled in a variety of cadences borrowed from other modes. The leading note of the Dorian was a tone below the hypate (f \(\beta\) a tone below g \(\beta\)).

#### IV. RHYTHM

With the exceptions of the Epitaph and Chorus from Orestes, the extant compositions give no indication of rhythm. From this circumstance, the unwarranted inference has been drawn that the rhythm followed the metre. Greek music has thereby been made a laughing-stock. In ancient Greece, poetry wielded such an immense influence, that the melody of the nomos, or of the classical ode, was subordinated to the metre. This led to what we should regard as a straining by the poet after metrical effect, for no poetry could equal in scope or freedom the rhythm of music—and to the development of new forms of instrumental accompaniment. The nomos was sung by the priest to the kithara. His skill was shown, not in the melody of the voice part, which was so circumscribed, that no room for originality was left to him, but by an elaborate counterpoint on the kithara. Quotations from Greek authors, which in unequivocal terms describe the heterophony of the accompanying instruments, have been collected by Westphal.<sup>22</sup> But the musician did not meekly submit to the poet. Much of the controversy between the 'rhythmici' and 'metrici' was due to a revolt, beginning as far back as the time of Euripides (480-406 B.C.), against the irksome practice of restricting the musician in the time he could allot to each syllable. Many quotations bearing on this point are to be found in Bellermann's notes to Anonymus de Musica. Dionysios of Halicarnassos, who wrote upon the subject of Greek pronunciation, at the beginning of the Christian era, regretted that, in his days, vocal and instrumental music subjected the words to the melody instead of the melody to the words. He gives an example from Orestes in which most of the accents are wrongly treated, and states further that musicians were wont to make the syllables fit the time, instead of cutting the time to fit the syllables. Very little imagination is needed to convince one that a musical and artistic nation could not have tolerated the tyranny of long and short in their music. The music of the two examples we have (the Epitaph and Chorus alluded to above) violates the metre in many instances. again, if we turn to Anonymus de Musica, we shall find a wealth of rhythmic forms which remind one of the talas or musical measures of India.<sup>23</sup> Oriental music of the present day indulges in the utmost complexity of rhythm. The

<sup>&</sup>lt;sup>22</sup> Author of *Harmonik* and *Melopoie* (1863 and 1886) and *Musik des Griechischen Alterthums* (Leipsic, 1883).

<sup>&</sup>lt;sup>23</sup> Some recensions of the hymn to Calliope contain instructions which seem to refer to the rhythm of the music.

absence of rhythmic signs in the three manuscript hymns presents no obstacle to the conclusion I wish to draw. In India, until recently, no one ever attempted to write down the rhythm of a song, although the notes in a kind of tonic-solfa were often placed above the words, just as in the examples before us. When popular teachers of music set to work to remedy this state of affairs, the only means that suggested itself to them was to take the unit of time known as the *matra*, and to put below each note a number or a fraction showing how many units of time or parts of such units it should occupy. Another row of signs was used to show where the beats came. The Greek metrical signs were obviously unsuited to any but the simplest forms of melody.

In my opinion, nothing can be more certain than that the music of the hymns to Calliope, Apollo and Nemesis did not slavishly follow the metre. It is therefore necessary to reconstruct the rhythm of these three specimens. The question arises whether the rhythm should be based generally upon accent or quantity, in other words, whether the strong beat of the bar should coincide with an accented rather than with a long syllable.

These three hymns belong to the second century A.D. It appears to me that the only way to make musical sense out of them is to follow the accents in preference to the metre. In the epitaph and chorus from Orestes, which are the only sure guide we have, the rhythm does not come amiss to the modern Greek. The chorus quite clearly makes rhythm follow accent. Some writers have traced the modern Greek stress-accent to the beginning of the Christian era. If the chorus from Orestes can be relied upon in this connexion, the stress-accent is to be credited with a much higher antiquity. Two views on the subject, widely held, are open to strong criticism. is that the ancient Greeks, in conversation, put the ictus on the long syllables. In a great many words this would imply a stress upon one syllable, and a rise of pitch on another. One has only to realise the difficulty of stressing a syllable without raising the voice, or raising the voice in pitch but not in loudness, to hold that the very strongest evidence is necessary to support such a view. The opinion is based upon two assumptions—one that the arsis and thesis of poetry imported a stress,24 the other that the stress thus inferred was not confined to poetry. The second view which many hold is that the Greek language could not have had any stress-accent, as the grammarians say nothing about it. Perhaps, in future generations, antiquarians will give as their considered opinion that the English language had no pitch-accent, as the lexicographers confined their attention to the ictus.

Is it not a curious circumstance that the Greeks divided their syllables into unit syllables and two-unit syllables, and subjected their speech-intonation to rule? The spoken word must always be fluid and liable to slight variations following the meaning. Even in regard to the position of the ictus, there can be no simple hard-and-fast rule. The pitch accent demands a considerable latitude and the relative length of syllables even more elasticity. What was it then that impelled the Greek poets to harness the metre and put shackles

<sup>&</sup>lt;sup>24</sup> Mr. Goodell (Chapters on Greek Metric, Yale University Press, 1901) criticises this theory.

upon the pitch-accent of speech? With extreme diffidence I suggest the following answer. The laws of metre were older than writing. They served as a mnemonic system. No better device for the preservation of knowledge could have been invented. Poetry, founded upon this artifice, wielded unbounded influence. Like the Vedas, it was sung and not merely declaimed. In order that the subtleties of the metre should stand forth, the ictus of speech was suppressed, and the coincident pitch-accent was subjected to rule and made to do duty for both.

In the renderings which follow, the rhythm of the three hymns has been based broadly upon the ictuses as they occur in modern Greek, as much allowance being made as is reasonably possible for differences in the length of syllables.

E. CLEMENTS.

I have added a harmonised accompaniment to three of the Greek compositions, and a counterpoint to the hymn to Helios and the first mural hymn. My main object in writing these accompaniments is to draw attention to the correct harmonies. I merely give a few excerpts from the extremely fragmentary second mural hymn. Missing words in all cases have been copied from the Supplement to the Musici Scriptores Graeci, Teubner Series. In filling up lacunae in the music, the rules followed as far as possible have been:—

- (1) The acute-accented syllable is raised.
- (2) The unaccented is lowered.
- (3) The grave remains at the pitch of the preceding syllable or is raised, generally one degree.
  - (4) The circumflex takes the falling tone.

#### SEVEN MUSICAL COMPOSITIONS OF ANCIENT GREECE.

The organ should be tuned as above described.

If a harp is used, it should be constructed and tuned as follows. The double-action harp, except for the skhismatic substitution of  $d \downarrow and g \not b$  for  $c \sharp and f \sharp$ 

#### Double-action Harp.

Pedals: First notch, the diminished semitone.

Second notch, the just semitone.

Tuning: in C Major, Ionian Scale-

Just fifths from c: g-d-a, and f. Major thirds: c-e and g-b.

#### Single-action Harp.

Pedals: the diminished semitone (taken in some instances as a substitute for the

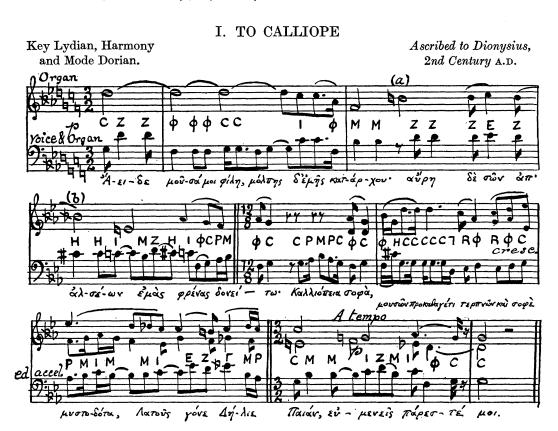
residual semitone).

Tuning: in C Minor, Aeolian Scale-

Just fifths from c: g-d, and f.

Minor third: c-e b.

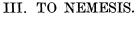
Fifths from eb: bb and ab.



- (a) Two recensions have what may be the staccato sign ( $\sim$  in one, in another; it should be  $\chi$ ). The sign  $\sim$  is also to be found after the first syllable of  $\Lambda \alpha \tau o \hat{v}s$ .
  - (b) Some recensions have N for H.



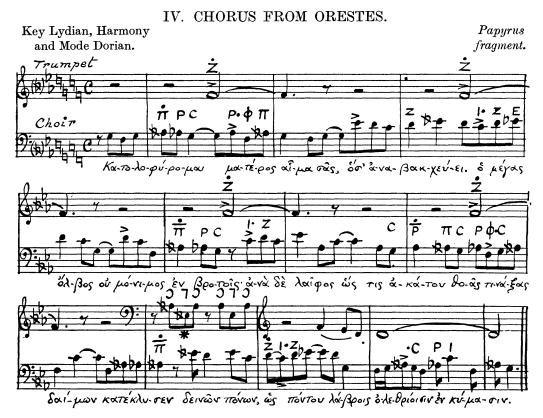












\* 7 is a mistake for  $\gamma$ .

# V. DELPHIAN HYMN I.







[Concluding fragmentary portion omitted.]

#### VI. EPITAPH OF SEIKELOS.



#### VII. EXCERPTS FROM DELPHIAN HYMN II.

In Instrumental notation, the bars imply no stress.

# A. Harmony Dorian, mode Hypodorian,

Mural Inscription, 1st Century B.C.



B. Harmony Dorian, mode Dorian, hexatonic; key d 1.



At  $\mu\epsilon\lambda i\pi\nu\sigma\sigma\nu$  de  $\lambda i\beta\nu\sigma$ , the original mode is resumed. The modes of the two excerpts are employed alternately. At d de  $\gamma\epsilon\gamma\alpha\theta$ , where  $\gamma\epsilon$  is made to the Dorian in d; then, at  $\lambda\mu\phi$  is  $\pi\lambda\sigma\kappa\dot{\alpha}\mu\sigma\nu$ , the Hypodorian re-enters. Lines 124 to 168 are too fragmentary for any conclusion to be drawn. The music appears to end, in a different tempo, in the mode in which it begins.

E. C.



Supplement to 'The Interpretation of Greek Music' (Continued) Author(s): E. Clements

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#### SUPPLEMENT TO 'THE INTERPRETATION OF GREEK MUSIC'

(J.H.S., XLII. p. 133)

THE diagram now given reproduces in a more logical form the vocal and instrumental schemes; it shows their underlying unity, and points to the use of the vocal scheme as an enharmonic and chromatic exercise for the trained singer. It will be observed that, with two exceptions, the intervals used are the just semitone and simple quartertone.

The instrumental signs which go to the notes of the ditonal Hypolydian scale from e's to es, to which, as I have pointed out, the kithara must have been tuned, are all in their normal upright left to right position. They are N,  $\Gamma$  (digamma),  $\Gamma$  (an old Corinthian form of  $\Gamma$ ),  $\Gamma$ ,  $\Gamma$ ,  $\Gamma$ . The last may be a mutilated form of  $\Gamma$ . N and  $\Gamma$  are extraneous signs.  $\Gamma$  is known to be an old form of  $\Gamma$ , but  $\Gamma$  was never written  $\Gamma$  in writing from left to right. I think it is a reasonable inference that N and  $\Gamma$  were used to mark respectively the *nete* and *mese*. One may deduce the theoretical structure of the Hypolydian as two conjunct tetrachords with an additional tone below.

It will not be out of place to observe that the dissection of scales into similar tetrachords has no longer any interest for us. Nothing material hinges upon the wearisome discussion of tetrachords to be found in Greek literature.

The most important factors in the scale of a mode are (1) the order of intervals in the octave, (2) the notes selected as predominant and final respectively. To detect the predominant note in a melody it is not sufficient to ascertain which note is most frequently sounded. The manner in which a note is approached is a more certain criterion. Emphasis is frequently given to the predominant by passing first to one side of it as though one's attention were concentrated elsewhere, then passing to the other side, as in a pair of changing notes or a figure in the Lancers, and finally leaping at it. This is well exemplified in the hymn to Calliope. C is the mese and predominant of that melody. Had it been in the Mixolydian, G would have been the mese and final, and D would have been the predominant.

E. CLEMENTS.





The Interpretation of Greek Music: An Addendum

Author(s): E. Clements

Source: The Journal of Hellenic Studies, Vol. 56, Part 1, (1936), pp. 25-35

Published by: The Society for the Promotion of Hellenic Studies

# THE INTERPRETATION OF GREEK MUSIC: AN ADDENDUM

The main object of this addition to the paper published under the above title in JHS xlii. 133, is to make known a new discovery in the shape of an unanswerable argument leading to the same solution as before of the problem presented by the Greek notation. This problem is still considered to overshadow all other problems. After the conclusion of the argument the writer proposes to make a few necessary corrections in

the former paper, and to lay further emphasis on certain points.

It is an unfortunate circumstance in the music of to-day that performers and composers alike, even those destined to spend their lives as devotees of opera and symphony, begin their careers with little or no acquaintance with the most important branch of musical knowledge, the theory of They have been taught to think in terms of a scale tuned by fifths (whether tempered or true makes no practical difference), and au fond their instructor is the piano tuner. This is quintal music, to borrow a term used by historians in speculation regarding primitive origins. Tertian music on the other hand is derived not only from the quint but from the true major and minor thirds and is, therefore, the basis of harmony. The quintal scale has no common chords; its triads are all discordant. The music of the organ and piano pretends that its dissonant triads are common chords, and claims therefore to have six of them in the major scale. No tertian major scale can have more than five; two have only three apiece. Nevertheless, since both systems are taught indiscriminately from the same text-books, tertian music uses six, frequently without any thought to the intonational consequences. The importance of intonation is overlooked, and the subject cheerfully abandoned to the acoustician. We have not yet discovered that intonation is concerned with ideals, and acoustics with brute measurements. Acousticians who have entered the field of music have left behind them a trail of misconceptions, out of which five may here be quoted:—(1) that Indian music is founded on caprice; 2 (2) that definite inferences regarding intonation can be drawn from measurements of holes and frets; 3 (3) that travellers' tales and primitive theories can be treated as evidence of fact; (4) that there is one 'just major'; (5) that, in the melodic descending form, there is one 'just minor.'

Greek theory was mainly concerned with intonation. From Pythagoras it received the most exact intonational notation that the world has ever known. Little use, however, was made of it. To grasp the

<sup>&</sup>lt;sup>1</sup> See the introduction to Düring's *Ptolemaios und Porphyrios*, Göteborgs Hogskolas Arsskrift XI (1934),

singers, not that of the bazaar or theatre, or the efforts of harmonium-trained amateurs.

3 Aristoxenos knew better (*Harm.* II. 42, 43).

<sup>&</sup>lt;sup>2</sup> The music meant is that of the hereditary Durbar

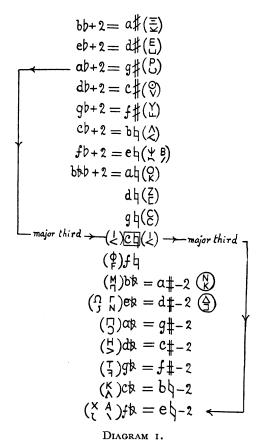
facts with which we are concerned, it is necessary to know how this came The theory, as in India, seems to have begun with an attempt to classify scales on the basis of an imaginary division of the octave into equal parts. The invention of the monochord or kanon by Pythagoras in the sixth century B.C. was destined in the long run to cause these speculations to be superseded by accurate measurements in terms of comparative string-lengths. Presumably with the help of the musician, he measured the national scale and reduced its intervals to quintalised substitutes, that is, intervals that could be got from fifths and octaves, and whose string-length ratios could therefore be put in the form  $2^x 3^y$ . This was essential to his plan, because he intended to put his notation in the form of a structure built of tetrachords, carrying its own meaning to the musician, without any explanation whatsoever. Possibly he was inspired by the monuments of Egypt. He took at the same pitch the octave scales of the C mode, D mode, E mode, and their corresponding hypo-modes with finals F, G, A. (The B mode was added on the same plan, before the time of Aristoxenos, by the men who carried on the traditions of the school he founded.) He dissected his six modal scales into E mode tetrachords in the usual Greek manner. He picked out their meses, and strung them in order of pitch in a scale. He adjusted that scale to quintal tuning. led to a slight readjustment of the pitch of the Lydian and Hypolydian scales (C and F modes) already plotted out. The quintal scale of the meses seems to have become known as the thetic scale.<sup>4</sup> It acquired importance in the theatre as the basis of the tuning method, for we learn that the theatre used all the six modes of Pythagoras.<sup>5</sup> It is probable that an eight-stringed kithara was tuned to the thetic scale; the mese as required was picked out and the rest of the modal scale tuned from it. This could be quickly done, and all the modes in turn could be got at about the same pitch. next step taken by Pythagoras in devising his notation was to take his six scales and extend each one from the mese up and down so that they became a complete two-octave system in the A mode. They now looked like six exactly similar two-octave systems at pitches that differed by fourths; they were to all appearance transposition-scales. They were in the modulating system, having a synemmenon tetrachord. Each of these systems was now called a tonos and named after the mode hidden within it. the musician, the name disclosed the mode, and the synemmenon tetrachord the intonation. These tonoi were exhibited with symbols to represent the notes. The twenty-four letters of the Ionian alphabet were used for the singing notation, and another series, called the instrumental notation, consisting of certain letters in three positions, erect, recumbent, and averted. was added for the use of the kithara player. Thus a mighty weapon for the advancement of harmony was forged. But it had no immediate success. Pythagoras was persecuted, and his followers killed or dispersed. More than a century later, Timaeus and Archytas among others were gathering up the remains of the musical activities of Pythagoras. Plato

<sup>&</sup>lt;sup>4</sup> Aristoxenos, *Harm.* III. 69; Ptolemy, *Harm.* II. <sup>5</sup> Anon. § 28, ed. Bellermann, Berlin, 1841. 10, 11.

was much interested in their work, but seems to have learnt nothing beyond the most elementary facts of intonation. The mention of the term apotome by those interested in the revival of Pythagorean learning 6 gives rise to inferences favourable to the hard or tertian diatonic as opposed to the soft or septimal. The apotome was the quintalised just semitone, and could be derived in three ways: (1) seven fifths up less four octaves, (2)three octaves up less seven fourths, (3) the tone less the leimma. Its ratio in the form  $2^x$   $3^y$  was  $3^7$   $2^{-11}$ . In his tonoi, Pythagoras took the interval in descent as three octaves less seven fourths, as will be demonstrated. It will of course be remembered that the use of fifths and fourths alternately amounts to the same thing as the use of fifths and octaves or fourths and octaves. Archytas put forward certain septimal scales. They are put out of court as explanatory of the notation, because his soft semitone could not be quintalised. His diatonic, the toniaion, was probably already in existence, but his enharmonic has the appearance of having been invented to explain the six tonoi. It is an impossible scale, suggested evidently by the erroneous idea that was then shaping itself that the enharmonic should divide the lowest interval of the E mode tetrachord into approximately equal parts. The note added by the enharmonic genus was in essence a grace note close in pitch to the note it ornamented. And that is what the notation gives us. We have the same thing. Our tetrachord is the C mode tetrachord; we think in terms of the major scale The result is that we enharmonically ornament the D's and A's instead of the F's and C's. But the modern theorist has not yet awakened to the fact. When he does he will perhaps embody it in a new genus. When Aristoxenos appeared on the scene, the seventh tonos, the Hyperdorian, had been added. This tonos destroyed the symmetry of the scheme by mixing enharmonic and chromatic tetrachords. It acted as a bridge to the later tonoi, most of which came into existence in the time of Aristoxenos. They had no enharmonic; they consisted of diatonic and chromatic. When the whole notation was given to the world by Alypius in the second century A.D., the enharmonic and chromatic were not distinguished, one being a copy of the other. It may be observed that the first seven tonoi gave the whole notation. No note was ever added. It is also worthy of notice that the additional tonoi were inserted between the original ones with consummate skill. We are forced to the conclusion that the men responsible were conversant with the meaning of the notation, and the intonation of all the common scales in use. Aristoxenos devoted his attention to music after the death of Aristotle in 322 B.C. He bitterly opposed the practice of the notation and the use of the monochord. He seems to have made common cause with the professional. He tried to justify his attitude.<sup>7</sup> The idea that students and amateurs should be enabled to acquire in a few days the knowledge and experience of a lifetime was repugnant to him. He therefore revived the obsolete pre-Pythagorean methods. For this and other reasons, Ptolemy, five hundred years later, condemned him as both stupid

<sup>&</sup>lt;sup>6</sup> Vide Gaudentius, ed. Jan, p. 343; pseudo<sup>7</sup> Harm. II. 41. Philolaus, ap. Boethium, Mus. III. 8.

and insincere.<sup>8</sup> Shortly before Ptolemy came Didymus, who, like Archytas, seems to have tried to explain the tetrachords of the first six tonoi. He had the distinction of being the first writer correctly to interpret the diatonic tetrachord  $(\frac{1}{15}, \frac{1}{10}, \frac{9}{8})$ . Ptolemy was the first to introduce us to the scales of Archytas and Didymus, and to give us the measurements of the syntonon, the favourite plain diatonic scale in the Alexandria of his day. Except for the philosophy of the third book, his *Harmonik* is in substance an elaborate and closely argued plea for the adoption of an eight-stringed kanon capable of giving the modes of any scale in exact intonation. He shows how scales



The figure 2 designates approximately 2 cents.; + means 'sharper by' and - 'flatter by.'

The symbols in circles are those of the duplicate notes.

may be invented with the help of a monochord, and gives the principles which, in his opinion, should govern the process. He does not admit apparently that scales derive from the analysis of living melody. Melody always precedes grammar and scale. His principles are also ill-founded. Like all the Greek scribes, he knows nothing of the final and dominant that define a mode and have more influence than anything else on the construction of its scale. He bestows too little attention in common with his predecessors on the plain tertian diatonic scales. Absorbed in the sup-

<sup>8</sup> Harm. I. 9, 10.

<sup>9</sup> Also named the syntheton.

posed rigidity of the E mode tetrachord he does not realise that it may sometimes be a false tetrachord, as in the Ionian.

Through all these centuries of idle controversy, the peasantry at their daily tasks were singing in the old ἀρμονίαι. That was the music that passed into the Church and laid the foundations of modern music. The modes had four parent-scales, the double syntonon, the double syntheton, the syntonon followed in ascent by the syntheton, and the false tetrachord, just semitone, major tone, major tone, followed by the syntonon, with the tone of conjunction a minor tone. The last is the śadja grāma of India, one of the most widely spread of all scales, the scale of the epitaph of Seikilos, the Ionian scale.

The synemmenon, we have said, gave the clue to the intonation of the six tonoi. It modulates to the nearest 'key' on the flat side. In the process (see Diagram 2), Doh is flattened and becomes the Soh of the new key. If the scale had been the syntonon, called by us in the C mode the 'just major,' Ray would have been flattened and made Lah. This turns on the false fifth. Every harmonic (or tertian) scale, consisting of three major tones, two minor tones, and two just semitones regularly placed, must have one fifth embracing both the minor tones. This can be proved mathematically or by simple trial. In acoustics it is called the grave fifth, but, in the theory of intonation, false is a better epithet because falsity is its main property, not size. A true fifth holds two major tones and one minor tone, whereas a false fifth holds two minor tones and one major tone. The false fifth is smaller by a comma. It is the scale-maker of tertian music. Any scale of the kind under consideration can be completely reconstructed if its false fifth is properly described; no other datum is necessary. The two true fifths that separate the semitones, and the remaining three fifths, also true, have merely to be fitted into their The false fifth Ray-Lah defines the syntonon, and the false fifth Doh-Soh the syntheton. In change of key, the false fifth is necessarily shifted, the original one being made true. Modulating on the flat side lowers its lower note; modulating on the sharp side sharpens its upper

In the proof we shall use the same notation as before, making  $\downarrow$  our pitch note. The four 'strings of fifths' mentioned on p. 136 in my former paper may now be called the four quintal series, and named: the low sharp series, the low series, the straight series, and the high series. The first we shall not need; for it will be seen from Diagram 3 that, where two notes have been coupled by a tie, the second is now identified with the first, whereas by an error in the former paper the second was made a comma lower. These notes are here referred to as the 'duplicated' notes (vide Diagram 1, note). As regards the properties of a quintal series, it may be remembered that any seven consecutive members of such a series form a quintal scale when brought together, and that alternate members are always separated by a major tone, provided they come together in the same octave. A reference to Diagram 1 shows that the series on the left is derived from the straight series in the centre by the major third. Middle C (c') enclosed in a square is identified with  $\downarrow$ , the mese

of the Lydian tonos. Its major third, e', generates the low series. The diagram also shows in the straight series how major thirds to a close approximation can be obtained from notes of one and the same series.

We shall confine the inquiry to the notes denoted by the usual letters of the Ionian alphabet in the vocal notation. Tetrachords an octave apart, such as (a) and (d) (Diagram 2) need not be separately considered. In each tonos any three consecutive tetrachords differ from one another. Beginning from the Hypolydian we have three different tetrachords; a new tetrachord in the shape of the synemmenon is added by the remaining tonoi, the Lydian, Hypophrygian, Phrygian, Hypodorian, Dorian, making eight tetrachords in all. It is probable that the original six tonoi gave no synemmenon to the Dorian. But we need that synemmenon for the proof, and justify ourselves on the ground that the diatonic scale of the



' + 2' means approximately 2 cents. sharper than the pitch shown by the notation.

next tonos, the Hyperdorian, is exactly similar to the diatonic in the other six tonoi.

We shall assume (1) that each tetrachord covers a true fourth, and (2) that every complete scale consists of two similar tetrachords. No other assumption is necessary.

In the Hypolydian, the terminals of the tetrachords (a), (b), (c) give this ascending series of fourths:— $_{h}^{W}$ ,  $_{r}^{T}$ ,  $_{c}^{C}$ ,  $_{<}^{I}$ ; The Lydian (tetrachord c) takes the series up to  $_{z}^{U}$ . We now descend two octaves down to  $_{z}^{Q}$  and the terminals of tetrachords (a), (b), (c) in the Hypodorian complete the series of ascending fourths  $_{z}^{Q}$   $_{z}^{Q}$   $_{z}^{Q}$ . The note with which we started may now be raised by an octave to  $_{K}^{Q}$ . The question is: what is the interval between  $_{K}^{Q}$  and  $_{z}^{Q}$ ? We fell an octave to  $_{K}^{W}$ , then rose four fourths, then

4 #OPOH # HOPOH HOHOW ODOH # # POH -2-2+7

ב ה SOUPC TY Φ X ΨΩ PR ΔΕΖΗΘΙ KAM NΞΟ ΠΡC TY Φ X ΨΩ PR I ער אים באם אים באם אים באם אים באם אים באם אים באם ב Tustermentateナトツ スチZ N/N コロE >V< ACT NAK JOC JLF ていらつして ユエト ヨロE ユエト 日日 H 3 JC T

La sichota Robotasicinas Capata sichogia Exact Interpretation Enharmonic Exercise

' + 2' means that the actual pitch of the Greek note is 2 cents, sharper than the pitch shown by the accidental; '- 2' means that the actual pitch is 2 cents. flatter. The duplicates are marked by slurs, and, in the intervals, by the figure 0. DIAGRAM 3.

fell two octaves, and finally rose three more fourths. That is a rise of  $7 \times 498$ , and a fall of 3600, a net fall of 114, the apotome. And this very pair of notes forming the apotome constitutes the lowest interval in the Dorian synemmenon. On the second assumption above, that interval can be traced right through the tetrachords under consideration. Every tetrachord therefore in accent begins with the apotome. Secondly, since two fourths subtracted from an octave leave a major tone, the interval  $\Phi$  C in the Hypophrygian is a major tone. It appears in the Lydian as the upper interval in tetrachord (a). On the second assumption above, that interval can also be traced in all the tetrachords. The diatonic tetrachord of Pythagoras was therefore apotome, quintalised minor tone, major tone, in cents, 114, 180, 204. Diagram 1 traces all the notes under consideration as a κοινωνία κατὰ τετράχορδα, 10 and shows how they may be rationalised, or dequintalised.

The duplicated notes next fall to be discussed. From the diatonic we have discovered the meaning of 22 notes out of those covered by the letters of the alphabet in the vocal notation. The remaining two,  $\Delta$  and N, appear, not in the diatonic, but in the enharmonic-cum-chromatic as it should be called.  $\Delta$  is in the Lydian, and N in the Hypolydian. N appears in the Dorian synemmenon, and both appear in the Hyperdorian, meson and synemmenon. With the exception of these three named tetrachords, every tetrachord in the enharmonic-cum-chromatic takes its pyknon in the instrumental form erect, recumbent, averted. Where the symbols used are among those we have just identified from the diatonic, the cent order of the intervals of the pyknon is +114, -24. We may assume that the pyknons in the Lydian and Hypolydian which contain the symbols  $\Delta$  and N, are in the same form. This establishes  $\Delta$  and N, by analogy, as duplicates of the erect notes  $\Gamma$  and M respectively. The Dorian synemmenon introduces abnormally a tetrachord beginning with an averted instead of an erect sign. The next erect sign is taken to make up the apotome, but the further flattening could not be indicated with the symbols in hand. The difficulty was overcome by proceeding to the next averted sign, making the tetrachord chromatic in the syntonochromatic colouring. Thus was the progression apotome-leimma concurrent turned into the progression apotome-leimma consecutive. If the tonoi be taken in the order given by the synemmenon tetrachords, which we may suppose to have been intended, it will be found that this latter arrangement is continued through the additional tonoi until the point where they begin to complete the harmonic circle and return to the Hypolydian. The diatonic synemmenon of the Hypoionian is  $X \oplus C O$ ; the cent intervals are 114, 204, 204. This is the false fourth. The same interval

intervals are 114, 204, 204. This is the false fourth. The same interval separates the proslambanomenoi of the Hypoionian and Ionian tonoi. It is here, therefore, that the correction of the comma is inserted. Who-

<sup>10</sup> Vide Aristides, Meibom. p. 25.

ever performed this operation may be regarded as an unknown musician who knew more about his art than all the theorists combined.

Diagram 3 gives the whole range of notes. The lowest line gives the accidentals of exact pitch; the middle line gives those which exhibit the instrumental notation to the best advantage, and the upper line indicates the possibility of vocalising the notes in their order. The differences involved in these several aspects of the notation are partly due to the fact that the low flats were sometimes used as such and sometimes as sharps. The difference is one of function, the sharp being associated with the idea of ascent by means of a semitone made familiar by constant use, and the flat being associated with the idea of a similar descent. The notes with erect instrumental signs are emphasised as crotchets.

The instrumental notation was evidently meant for the lyre or kithara. Vase paintings shew both instruments with a bar for altering the pitch,



but the bar was not invariably attached to them, not 'standard' to use a modern expression. To quote from Plato: 'in all lyre-playing the pitch of each note is hunted for and guessed; so that it is mixed with much that is uncertain, and contains little that is steady'. We may safely assume that the erect letter stood for the open string, the recumbent for the just semitone (rather than the quintalised apotome) obtained by a full turn of the bar through a right angle to the left, and the averted to an incomplete turn resulting in the quintal semitone or leimma. Aristoxenos, in dissecting the tetrachord, assumes that the mese, lichanos, parhypate, hypate invariably followed the order of pitch. Centuries earlier, the player, having plucked the topmost string or hypate with the thumb, gave a full turn to the bar, and again plucked the string with the thumb, sounding the parhypate. He played the lichanos with his forefinger on the next open string. It could, however, be got from the first string by the

half turn. That would mean three strokes on the hypate followed by a leap over the next two strings to the mese. In Diagram 4, the symbols for the lichanos agree with Alypius and Aristides, but not with most recensions of the three manuscript hymns. The latter prefer the open string. Again it is important to notice that Alypius studiously avoids the term lichanos in the diatonic. Perhaps the extension of the notation to auletic led to the abandonment of the fingering tradition in favour of the idea of pitch. The line of pitch does not suit the enharmonic genus, for the simple reason that it is not easily vocalised. The chorus from Orestes gives both progressions, that of Pythagoras and that of the post-Pythagorean theorists, the zigzag and the straight line. The zigzag is used first in the chorus and is more favoured.

In lyre-playing it seems to have been the practice when tuning the Lydian mode to slacken all the strings as a preliminary. That would undoubtedly be the quickest method, because all the notes of the scale are low except the final C and its fourth F. There may have been some contrivance to limit the slackening to the comma. The final and its fourth could then be tuned up to their original pitch.

It is to be hoped that in future more attention will be paid to the notation and the surviving music, for more is to be learnt from them than from the theorists.

The main correction to be made in the former paper is in the treatment of the duplicated notes. The correction makes no difference to the music; moreover it removes the difficulties there discussed. For example, the instrumental passage from the chorus becomes a striking corroboration instead of an anomaly. As regards the barring of the music of the manuscript hymns it may be pointed out that the only pieces with rhythmic signs, namely the chorus and epitaph, are seen to be barred if their rhythm be closely examined. The writer is pleased to find that he is strongly supported by the opinions expressed in 1880 by Dom Pothier (Mélodies Grégoriennes, Tournai), who says, on p. 125: 'to ignore accent and keep to quantity was never the mode with any language, accentus anima vocis. A point of detail of considerable importance is the meaning to be attached to the three signs allotted to the falling tone at the end of the epitaph. The middle sign is a cross; it is not meant for a note. The common error of putting three notes to the falling tone in this instance, and thereby depriving the melody of all meaning, has been copied by a famous modern composer. Lastly, it was noticed that the extant music sometimes makes the mese the final and the hypate and nete the dominants. The inference was not clearly expressed that the prefix 'hypo-' served to indicate this exchange of functions. If this important inference be accepted, it makes the mode of Nemesis the Hypophrygian. It is supported by Ptolemy's assertion that in the beginning there were three modes only, but too much importance should not be attached to that.

<sup>12</sup> One stroke with the glide is a probable alternative. Lyre-playing could be supremely beautiful.

Anyone who heard Mushraf Khan on the bina would understand.

There are a few corrections to be made in the music. The more important are the following:—Calliope: on the first syllable of  $\mu\delta\lambda\pi\eta\varsigma$ , substitute ab for f. The falling tones on the words δονείτω and  $\mu$ ουσῶν need adjustment. Nemesis, eighth bar: the second syllable of  $\theta$ νατῶν should take both the notes  $\neg$  and  $\sigma$ . In that hymn, the notes  $\neg$  and  $\Lambda$ , as used in the several recensions, have been taken to be intended for  $\Gamma$  and  $\Lambda$ , now known to be duplicates.

In striving to avoid the cutting of fresh type, the writer conceived the idea of using capitals for the straight or quintal notes and small letters for the low e of the major third Ce, and the quintal series of low notes derived from it. The result is here shewn in the four primary scales of ancient

Greece:—

E mode: Dorian or Syntheton: e F g a b C' d' e'.

Syntonon: e F G a b C' D' e'.

C mode: Aeolian: C d e F G a b C'.
D mode: Ionian: D e F G A b C' D'.

E. CLEMENTS.

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Philo on Music

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# Philo on Music

#### SIEGMUND LEVARIE

hilo is generally recognized as one of the most influential philosophers of the Graeco-Roman era. Yet his references to music—unlike those of his predecessors Plato and Aristotle, or of his successors St. Augustine and Boethius—have remained buried in his voluminous writings. There is some justification for this neglect. Philo was not concerned with music theory, as were the philosophers mentioned above. Whatever he says about music is characteristic of his period rather than original. As an educated Jew, son of a wealthy Roman civil servant, living in the sophisticated Grecian society of Alexandria at the time of Christ, he explored the musical traditions transmitted through the Old Testament and Plato to his contemporaries. He was aware of performance practices and musical thoughts around him and used his musical knowledge and observations for frequent and telling illuminations of his philosophic treatises.

All ancient civilizations seem to have placed music at the source of their religious and cultural experiences. In his brilliant interpretation of Indian philosophy, for instance, Antonio de Nicolás writes: "It is essential . . . that we get ourselves ready to move, in one swift jump, from the prosaic, discursive, lengthy and conceptual ground on which we are accustomed to stand, into the moving, shifting, resounding, evanescent, vibrating and always sounding . . . musical world on which the Rg Veda stands." An approach of this kind to the Bible yields meanings with which Philo and his generation were well familiar. His exegesis of the Creation, to give an example, abounds in musical analogies, allegories, and metaphors, of which the following is a good representative (*De opificio mundi* 89–128).

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<sup>&#</sup>x27; Meditations through the Rg Veda (Stony Brook, New York: Nicolas Hays, 1976), p. 11.

God invests the seventh day with dignity to celebrate the completion of the whole world. Philo doubts "whether anyone could adequately celebrate the properties of the number 7, for they are beyond all words. Yet the fact that it is more wondrous than all that is said about it is no reason for maintaining silence." The number 7 is a "bringer of perfection." It is "absolutely harmonious and . . . the source of the most beautiful musical arrangement [diagrámmatos] which contains all the intervals [harmonías]: the fourth, fifth, and octave; and the arithmetic, geometric, and harmonic progressions [analogías] as well. The mathematical table is formed out of the numbers 6, 8, 9, 12. Now 8:6 is as 4:3, the interval [harmonía] of the fourth; 9:6 is as 3:2, the interval of the fifth; 12:6 is as 2:1, that of the octave." Philo lists "all these qualities and more" related to the "marvelous nature" of the number 7 but returns, here and elsewhere, to stressing its influence by way of music, one of the "noblest of sciences."

The virtues of the quantity 7 are explained by the "beautiful sounds" of the musical world—the opposite of the approach modern physicists would take. For Philo, numbers are symbols of deeper truths, best revealed through music. He asks, "why are there 10 commandments? 10 high holidays? a fast on the 10th day of the period of Atonement?" (*De specialibus legibus* II, 200). Again he refers to the musical intervals mentioned above, adding that 10 "also contains the ratio of 9:8 [the wholetone], so that it sums up fully and perfectly the leading truths of musical science, and *for this reason* [italics mine] 10 has received its name of the all-perfect."

Such statements are not startling in a world oriented toward sound and music rather than sight and touch. Philo lived in a period of decisive spiritual change. In the Old Testament, God is a voice. He creates the world by saying, "Let there be." He speaks to mortals but does not show himself. In the New Testament, God becomes visible. He appears on this earth. Most of Philo's metaphors and allegories are still acoustical. "For as the lyra or any musical instrument is out of tune [ekmelès] if even one tone and nothing more be false [apodòs], but in harmony when a single plucking produces consonant sounds, so it is the same way with the instrument of the soul which is dissonant [asýmphonon] when stretched too far by rashness toward the highest pitch or when it is relaxed beyond measure by cowardice and loosened toward the lowest" (De ebrietate 116).

<sup>&</sup>lt;sup>2</sup> The English text throughout this essay is that of the Loeb Classical Library (12 volumes), with modifications based on my own translation from the Greek. The modifications affect particularly, but not exclusively, musical terms which understandably troubled the otherwise superior philologists.

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In a similar spirit he writes about "the vast multitude of ills which are found in the individual man, especially when the combination of voices within him is out of tune and unmusical" (*De confusione linguarum* 15). The unrhythmic, unmeasured, and disproportionate in man can be healed through rhythm, meter, and proportion by way of polished music (*De cherubim* 105). "Music will charm away the unrhythmic by its rhythm, the incongruous by its proportions, the false and tuneless by its melody, and thus reduce discord to concord" (*De congressu quaerendae eruditionis gratia* 16).

Philo takes the spiritual quality of music for granted, and only a society which thinks of music merely as entertainment will find his views esoteric. "The ears hear, but the mind through the ears hears better than the ears" (*De congressu quaerendae eruditionis gratia* 143–44).

The relation of the metaphysical truth of music to the earthly executor of the art furnishes a recurring motive: "When a musician or scholar has died, the music or scholarship that has abode in individual masters has indeed perished with him, but the original pattern of these remain and may be said to live as long as the world lasts; and by conforming to these, the men of this generation and those of all future generations in perpetual succession will attain to being musicians or scholars" (Quod deterius potiori insidiari potet 75). And: "For states are better than the individuals who embody them, as music is better than the musician . . . and every art than every artist, better both in everlastingness and in power and in unerring mastery over its subject matter" (De mutatione nominum 122).

Philo's musical references must not be understood as poetic sentimentalities. While not a professional musician, he knew the basic facts of music theory and practice. He quotes the then accepted organization of musical "science" into rhythm, meter, melos; into chromatic, enharmonic, diatonic species; into the main intervals of fourth, fifth, octave; and into conjunct and disjunct melodies (De agricultura 137). Introducing the five senses as "understanding's messengers" and "bodyguards of the soul," he devotes a specific discourse to sound and the particular virtues of structured tone: "Sound altogether does not elude our discernment . . . We know that one tone is high, another low; one fitting a melody and proportionate, another out of tune and most unmusical; one louder and another softer. Tones also differ in countless other respects: in genera, timbre, intervals, conjunct or disjunct systems, and consonances . . . In articulate sound, moreover, an advantage possessed by man alone of all living creatures is that sound is sent up from understanding; that in the mouth it acquires articulation; that the beat or stroke of the tongue imparts articulation and speech to the tension of the voice; and that the result is not just idle

sound and unshapen noise because it is ruled by the mind, its herald and interpreter" (*De somniis* I, 27–29).

Having praised the human voice as the "chief and most perfect of all instruments" which sets "a pattern made ready beforehand for the instruments that were to be fashioned artificially," Philo turns to the structure of the ear (De posteritate Caini 103 ff., probably leaning on Cicero's similar exposition in De natura deorum II, 159): "Nature turned [the ear] with her lathe, and made it spherical, drawing circles within circles, lesser within larger, in order that the sound that approached it might not escape and be dispersed outside of it, but that the thing heard might be collected and enclosed within by the circles, and being as it were poured through them, be conveyed into the receptacles of the mind. We see here at once a model for the theatres seen in thriving cities, for theatres are constructed in exact imitation of the shape of the ear." Along the same lines, Philo explains that the windpipe in the human throat is structured precisely so as to be able to sing all genera, modes, and intervals, by step or skip. Instruments are merely imitations of this natural model. But both voice and instruments must be controlled by our mind. "For just as an instrument put into the hands of an unmusical person is tuneless, but in the hands of a musician answers to the skill which he possesses and becomes tuneful, in exactly the same way speech or sound set in motion by a worthless mind is without tune, but when set going by a worthy one is discovered to be in perfect tune." Elsewhere he comments: "It is our business not to practice music unmusically" (Quod deterius potiori insidiari solet 17–18).

Metaphor and analogy provide a ready link to musical practices. Tone qualities and behavior set a model for human qualities and behavior. Musical instruments are proportionally marked off to give each tone its fitting pitch and adapt it so as to sound well together with other tones. Similarly man should apportion his actions in "proper sections" (*De sacrificiis Abelis et Caini* 74). The soul must be set "like a lyra musically, not with high and low tones but with the knowledge of moral opposites . . . not stretching it to excessive heights nor yet relaxing and loosening the harmony of virtues and things naturally beautiful, but keeping it ever at a proper tension, striking it and accompanying it on a stringed instrument in tune" (*Quod Deus immutabilis sit* 24).

The last, incidental phrase creates a concrete image of a performance practice: instrumental support of a vocal monody. A similar situation is described, again incidentally, in Philo's report on his legation to Gaius (*De legatione ad Gaium* 42). He found the emperor so "fascinated by the music of kithara and choral singers [that he] occa-

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sionally sang along." A comparable scene on a more elevated level unfolds at the death of Moses. While he sings a thanksgiving hymn to God, "with every kind of harmony and sweet consonance," angels gather around him "as watchers, observing in accordance with their own skill whether the song had any false note" and marveling "that any man imprisoned in a corruptible body could like the sun and moon and the most sacred choir of the other stars attune his soul to harmony with God's instrument, the heaven and the whole universe" (De virtutibus 72–75).

At an earlier occasion, Moses had functioned as a choral conductor. After the defeat of the pursuing Egyptians at the Red Sea, "what should Moses do but honor the Benefactor with hymns of thanksgiving? He divides the nation into two choirs, one of men, the other of women, and himself leads the men while he appoints his sister to lead the women that they might sing hymns to the Father and Creator in agreeable tones, with a blending of tempers and melodies, eager to render to each other like for like, combining into a consonance low and high; for the tones of the men are low, high of the women, from whom, when they are blended in due proportion, results the most pleasant and panharmonic melos. All these myriads were persuaded by Moses to sing with hearts together the same hymn . . . He himself led off the song; his hearers massed in two choirs sang with him" (De vita Mosis II, 256-57). His singing along while conducting assumes allegorical significance. "Of the two choirs, male and female, standing echoing and antiphonally, . . . the male choir shall have Moses for its leader, that is Mind in perfection, and the female choir shall be led by Miriam, that is Sense Perception made pure and clean. For it is right to make music with both Mind and Sense" (De agricultura 79–80).

Philo's most valuable report on musical performance practices derives, not from an interpretation of biblical passages, but from personal observation of a sect of ascetics living near him in the vicinity of Alexandria. Known as Therapeutae, they followed a pre-Christian monastic discipline, already ancient at the time of Philo and Jesus. Philo's long and detailed description of their practices leads up to the musical climax of one of their festal meetings. After preliminary prayers and after the president has made a long speech, "lingering over it and spinning it out with repetitions, . . . universal applause arises showing a general pleasure in the prospect of what is still to follow. Then the president rises and sings a hymn composed as an address to God, either a new one of his own composition or an old one by poets of an earlier day who have left behind them hymns in many meters and melodies . . . lyrics suitable for processions or in libations and at the altars, or for the chorus whilst standing or dancing, with

careful metrical arrangements to fit the various turns and counterturns. After him others take over as they are arranged and in the proper order while all the rest listen in complete silence except when they have to chant the closing lines and closing sections [ephýmnia], for then they all, men and women, lift up their voices. When everybody has finished his hymn, young men bring in the supper . . . after which they hold the sacred vigil conducted in the following way. They rise all up together and standing in the middle of the refectory they first form themselves into two choirs, one of men and one of women, the leader and director chosen for each being the most honoured amongst them and also the most musical. Then they sing hymns to God composed of many meters and melodies, sometimes chanting together, sometimes antiphonally, hands and feet keeping time in accompaniment, and rapt with enthusiasm they execute now the music of the processional, now of the epodes (stásima) and of the strophes and antistrophes of the dances. Then when each choir has done its part in the feast, having drunk as in the Bacchic rites of the strong wine of God's love, they mix and both together become a single choir" (De vita contemplativa 64 ff.).

The description of the final music of the scene raises some questions. In classical Greek drama, four centuries before Philo, the chorus was governed by an established structure. One half of the entire group made a poetical, musical statement, the strophe or turn. The other half answered with a parallel counterstatement, the antistrophe or counterturn. Then they joined for a crowning summation, the epode or stand (*stasimon*). Did Philo list the closing *stasimon* before the strophes to convey a sense of the "rapt enthusiasm" of the feast? Or did his generation no longer pay much attention to the classical choric behavior? Or did Philo merely mix what he remembered of the formal arrangement of a Greek drama with his clear view of the two choirs organized by Moses at the Red Sea? Perhaps the Therapeutae themselves had merged the two traditions, just as Philo throughout his work had tried to reconcile Platonic thought and Old Testament authority.

In his comprehensive study of Philo, Harry Austryn Wolfson shows that the philosopher conceived of three definite laws of nature: the law of opposites which states that all things in the world are divided into two equal though opposite parts; the law of the harmony of opposites which establishes an equilibrium; and the law of the perpetuity of the species which wills that nature should run a course that brings it back to its starting point.<sup>3</sup> Musicians sensitized to the

<sup>&</sup>lt;sup>3</sup> Philo: Foundations of Religious Philosophy (Cambridge, Massachusetts, 1947) I, pp. 332 ff.

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pervasive forces of polarity, harmony, and perpetuity readily accept these laws as basic, yet the supportive and otherwise persuasive evidence supplied by Wolfson completely ignores music. The characteristic examples given in this paper confirm the view that Philo and his contemporaries, unlike later generations, still recognized music as a central spiritual force.

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Music in Ancient Crete and Mycenæ Author(s): Otto Gombosi

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#### PHILADELPHIA CHAPTER

(All the meetings of this chapter were held in Merion, Pa.)

# Music in Ancient Crete and Mycenæ Otto Gombosi (March 11th, 1940)

The most characteristic instrument of Antiquity was the lyre. It appeared in Mesopotamia about 3000 B.C., but its rudimentary form, which shows its descent from the bow-harp, cannot be found either in Western Asia or in Egypt. The most primitive form of the lyre is preserved in marble figurines of the early Bronze Age (about 2000 B.C.) from the Cyclades. There the lyre, the double aulos, and perhaps the tambourine were used in worship and for funeral rites. The cultural wave that brought these instruments to the "red-ware" culture of the Ægean originated in Mesopotamia in the 4th millenium.

This Ægean culture ended in a series of catastrophes about 1900 B.C. After that Crete took over the leadership for about 600 years. Its musical instruments show Mesopotamian and Syrian influences, but their most remarkable feature was the conservation of old Ægean traits and the development of those traits under Egyptian influence. The typical form of the Cretan lyre shows both Ægean and Egyptian features. Some instruments were exclusively ritual (shell trumpet, cymbals, sistrum); others were used not only in rites but also in social and private life (lyre, double aulos). The use of Pan-pipes is certain, and that of the transverse flute very likely.

The Mycenæan culture simplified the Cretan lyre by crossing it with a variety of the small Syrian lyre developed in Asia Minor. This is the lyre of Homer, the "phorminx" or "kitharis". Homer did not know the tortoise-shell "lyra". The aulos also survived the fall of Cretan culture. Under Oriental influence the bronze trumpet, as a military instrument, replaced the ritual shell trumpet. But the Mycenæan world dissolved before further influence of the Orient—very strong in Phœnicia and Cyprus—could be exerted upon it.

The Cretan instrumental apparatus survived in Etruria, to which the Tursci of Asia Minor migrated between 1200 and 900 B.C. The peculiar form of the Cretan lyre can be found there and in a few Greek localities where the Cretan element was strong enough—in Attica and Bœotia.

The early Greek instrumental apparatus had clear connections with that of Crete. Now, instruments have always been the vehicles of religious ideas, rites, styles, and tone-systems. Thus one com-

ponent of early Greek music was definitely of Cretan origin. This conclusion is confirmed by linguistic evidence. The names of poetic and musical forms—hymnos, elegos, thriambos, dithyrambos, paian—are of pre-Greek origin. The Dionysiac rite seems to have conserved many Cretan elements. Cretan are the names of certain instruments: phorminx, syrinx, photinx, salpinx; and, finally, Cretan is the costume of the lyre player as well as the word ametor, designating the lyre player at public contests.

But the Cretan elements were overshadowed by the barbaric forces of the Dark Ages and survived only in a petrified and simplified form. There is but one relevant fact known from these Dark Ages (12th-9th centuries B.C.): during them the lyre was transformed into the primitive "lyra", with a body of tortoise-shell and uprights of animal horn. The number of strings was reduced to three or four. The name "lyra"—first mentioned in the 7th century B.C.—may be of Indo-European origin.

In this "proto-geometric" Age, two different musical cultures seem to have clashed, the "Creto-Mediterranean" and the "Dorian-Indo-European". As far as we can judge, it was the Creto-Mediterranean element that was responsible for the practice of melismatic, creative reworking of melodic norms in Greek music, as well as for the characteristic tonality of that music, which seems to have been the common tonality of Mediterranean cultures.



The Sources and Development of the Ethical View of Music in Ancient Greece

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# THE SOURCES AND DEVELOPMENT OF THE ETHICAL VIEW OF MUSIC IN ANCIENT GREECE

## By EDWARD A. LIPPMAN

ONCEPTS of the ethical force of music are a characteristic and intrinsic feature of the Greek outlook; long before they become explicit in philosophy they are expressed both in myths of musical magic and in various fields of musical practice, which involve more properly ethical if less spectacular effects. Myth, religion, medicine, and ceremony all unite to give moral concepts their strength and diversity, and these formulations do not simply disappear with the advent of philosophic thought; their contribution to ethical theory is especially significant because they continue on alongside philosophy, giving it depth and social relevance.

Myths that tell of the power of music are concerned primarily with the compulsive character of human response; thus it is not surprising to find man in the company of animals, plants, and inanimate nature. The irresistible and fatal attraction of the Sirens has its parallel in the fascination Arion exercised over dolphins, or in Amphion's ability to make stones arrange themselves in order, while the universal influence exerted by Orpheus extends from nature to the gods. It is accordingly the suspension of the will that appears as the most striking feature of musical magic; the action of music is so direct and potent that it knows no resistance. Most typically a kind of hypnosis is produced, an enchantment in which the hearer is rendered motionless; yet we can say that the music affects feeling as well as will, for the influence is a total one in which the faculties are not distinguished.

The mental cures of orgiastic ritual are quite different. We are still in the magical province of physical medicine when Odysseus's wound is staunched by a chant,<sup>1</sup> but in Dionysiac rites we leave magic for matters

<sup>&</sup>lt;sup>1</sup> Odyssey, XIX, 457.

of fact.<sup>2</sup> Both the Thracian cult of Bacchus and the related Phrygian cult of Cybele made use of wild dance and music, with the effect of purgation and purification. The fervent and stimulating character of the music was due to a great extent to the aulos, an instrument also played with intoxicating effect by Marsyas, the Phrygian nature god who is the counterpart of Pan. In Plato's Laws, dance and the syrinx are made responsible for quieting the frenzy of the Bacchantes, while in the Ion,<sup>4</sup> we learn that during the dancing of the Corybantian mysteries the revelers were not in their right mind. Orgiastic practices are connected in general with Asiatic religion, with Thrace and Phrygia, and they form a sharp contrast to the more characteristically Greek myths of musical magic, which revolve around the use of the lyre and the voice, and are centered in calm rather than excitement. Again, however, feeling is not distinct from will; there is a highly emotional but also thoroughly compulsive response. But in addition, the essentially magical effects of tone and of particular melodies are joined by a direct and frenzied participation; to the stimulus of melody there is added the excitement of dance, and finally the purging and purification that are the more indirect but equally intrinsic effect of the whole. Thus music is both a cure and a cause of the disturbance, for if it does not produce it altogether, it certainly brings about an intensification.<sup>5</sup> The resultant cure, accordingly, is homeopathic rather than allopathic; the final calm—or exhaustion—is not the outcome of soothing music but of catharsis or emotional discharge. These rites are evidently quite like the epileptic fits of the shaman, the dancing epidemics of the Middle Ages, the 17th-century outbreaks of Tarantism, or the uncontrollable jerks of American revivalist meetings; probably in every case, religion is an essential factor.

Thus we are dealing not only with a medical phenomenon but also with a spiritual one, not simply with a purification but with a heightening of human power until it becomes identified with divinity. In terms of religious activity, this is the route of mysticism rather than reason, or of

<sup>&</sup>lt;sup>2</sup> A great deal of information about the Dionysiac, Orphic, and Pythagorean cults is assembled in the classic work of Erwin Rohde, *Psyche*, transl. from the 8th ed. by W. B. Hillis, London, 1925, Chs. 8-11. See also Jane Ellen Harrison, *Prolegomena to the Study of Greek Religion*, 3rd ed., Cambridge, 1922, and W. K. C. Guthrie, *Orpheus and Greek Religion*, London, 1935.

<sup>&</sup>lt;sup>3</sup> Laws, 790e-791a. Plato actually describes the cure of Bacchic frenzy as an allopathic process; music produces a quietness of the soul not by aggravating and then discharging an evil affection, but by combatting and overcoming it with an opposed and beneficial external motion. Yet the process is thought of as cathartic.

<sup>4</sup> Ion, 533e-34a.

<sup>&</sup>lt;sup>5</sup> Evidence may be found in the remarks Aristotle makes on the Phrygian mode (*Politics*, 1340b, 4-5) and the aulos (*ibid.*, 1342b, 2-7).

emotion rather than contemplation; it is turned inward to the divine in man rather than outward to the heavens. Indeed the myth of the devouring of Dionysus by the Titans made it possible to account for the presence of god in man, and the mystic experiences fostered by intoxication and music provided a confirmation. In a transient type of madness the soul was ecstatically separated from the body; its divine nature enabled it to achieve mantic power. But most important of all is the fact that rite involves an element of imitation, which readily enters along with dance. The imitation takes the form of pantomime, but not as a conscious art exercised with detachment; instead it becomes an identification of the initiates with the actual followers of Dionysus, and through them, with the god himself. In this activity we have the archetype of mimesis and of drama; imitation—like Greek educational and ethical concepts in general—is associated originally with music and pantomimic dance rather than with painting and sculpture. And it is the imitative aspect of religious orgy that makes it comparable to normal educational procedures as well as entailing a greater concreteness in the nature of music.

The Orphic movement of the sixth century B.C., by contrast, reveals conceptions close to those of musical myth. Although Orphism continues to pay allegiance to Dionysus, it actually represents the fruitful composite of the Dionysian and Apollonian cults that was manifested most conspicuously in the Delphic shrine. Clear perception and knowledge—the whole visual mentality eventually consummated in the Platonic Ideas—become important factors, along with the instrument of Apollo, the lyre. The religious amalgamation can almost be thought of as a new influence of music on the Apollonian outlook. With it all, Orphism remained mystical; its aim was to purify the soul; its prophet, although often considered to be the son of Apollo, was a Thracian musical magician. Elaborate doctrine was added to rite, and mythical thought moved closer to philosophy. The dual nature of man and the immortality of the soul were clearly formulated in the concept of transmigration, and the primitive Dionysian cult, which had developed centuries earlier, was elaborated into a whole monastic code of life. With Dionysus become an Olympian god, only remnants of the original chthonian aspect of orgiastic ritual were preserved in the wheel of birth and its interesting parallel of Orpheus's trip to the underworld. But in general the Dionysian heritage is easily seen; Herodotus mentions the "rites called Orphic and Bacchic" in one breath,6 and Orpheus himself is torn apart by the maenads quite like the sacrificial bull of the Bacchic communion, although his fate might have been earned

<sup>&</sup>lt;sup>6</sup> The Persian Wars, II, 81.

by apostasy. We cannot doubt that the concept of music had been radically changed; the Orphics are concerned with the lyre and the voice rather than the aulos, with enchantment rather than frenzy, and even prophecy takes on a reasonable instead of a rapturous character. Dance is apparently absent, while the appearance of song means that some contribution is made by the specifically rational element of music. In general, music is no longer an inarticulate outpouring of emotion given force only by pantomime, but a harmonic science with a tonal as well as a verbal logos. This is all a concomitant of an interest in the purification of the soul rather than its identification with divinity, and of a reliance on asceticism and on freedom from contamination rather than on exhilaration and frenzy.

The most important of the Orphic sects were the Pythagoreans, and they seem to have added an Egyptian element to the movement; Herodotus goes so far as to state that the Orphic rites were really Egyptian and Pythagorean. Possibly it was this constituent that transformed Orphism, moving it in the direction of philosophy and science, which were capable of new growth and wider influence. Eventually there was a division between the esoteric or religious Pythagoreans, who were known as akousmatikoi, and the exotic or scientific group, known as mathematikoi. The two parties differed not only with respect to their interests, but also because the one was monastic and the other public in its way of life. The novel characteristics of Pythagorean thought are evident in the change they effected in cosmogony. The Orphic cosmogony extends the Hesiodic by its tendency to personify abstractions; it is still a theogony, but its gods are often concepts expressed in an old form. In the Pythagorean cosmogony there is still a formal correspondence with the Orphic hierarchical picture of divinities, but the gods themselves have disappeared, leaving only traces behind in the creative Monad and the indefinite Dyad. Mythology has with this step become philosophy; and although the mathematical studies of the Pythagorean Brotherhood reflect in their very constitution the dominant position of music, there can be no doubt that a new and higher purification was discovered, and that theory was substituted for sonority. Even the stress on abstinence and asceticism in the conduct of life has unmistakable implications for the kind of music the Pythagoreans may have employed, if indeed they employed any at all; for neo-Pythagorean legends notwithstanding, it is quite possible that the Pythagoreans turned away more or less completely from sensory experience, even from that which might involve tenuous

<sup>7</sup> Loc. cit.

emotions, and towards quiet contemplation and speculative thought. Certainly the later "so-called" Pythagoreans to whom Aristotle refers<sup>8</sup> were mathematicians; the *akousmatikoi* disappeared with little trace, and we can only conjecture about the nature of their practices, although the religious society, still more than the private philosophic or poetic school, is very likely to have made use of music, perhaps in a fashion close to that of the medieval cloister. In any event, it is the soothing effect of music that will bear a direct relation to knowledge and harmony; even the Sirens, who would appear to represent the purely sonorous magic of tone, promise knowledge to Odysseus and attract him partly for this reason also.<sup>9</sup> Words can be combined with the lyre but not with the aulos, and Aristotle is not indulging in a casual fancy when he interprets Athena's rejection of the aulos as an expression of her attribute of knowledge, and of the fact that the instrument contributes nothing to the mind.<sup>10</sup>

Plato takes the orgiastic uses of music very seriously indeed, and tries to explain them and generalize them so that they are applicable to normal educational procedures. He even comes to classify education in general as a type of purification.<sup>11</sup> Just as he retains myth in his metaphysics for those problems that dialectic is helpless to solve, so he is really not willing in his ethics to abandon either the orgiastic or the hypnotic effects of music. Even philosophic discourse, itself a kind of music, takes on a magical aspect, and Socrates is described as casting a spell over Meno, and enchanting him.<sup>12</sup> Plato may reject the aulos in the *Republic*,<sup>13</sup> but this severity — necessitated by a higher cause — can become admiration elsewhere. When Alcibiades compares Socrates to Marsyas, for example, all the powers of music over the human soul appear as achievements that philosophy emulates:

And are you not an aulos player? That you are, and a performer far more wonderful than Marsyas. He indeed with instruments used to charm the souls of men by the powers of his breath, and the players of his music do so still: for the melodies of Olympus are derived from Marsyas who taught them, and these, whether they are played by a great master or by a miserable aulos-girl, have a power which no others have; they alone possess the soul and reveal the wants of

<sup>8</sup> See, for example, Metaphysics, 985b, 24.

<sup>&</sup>lt;sup>9</sup> Odyssey XII, 39-45.

<sup>10</sup> Politics, 1341b.

<sup>&</sup>lt;sup>11</sup> Sophist, 231b. In Laws, 790c-92e, after describing the musical cure of Bacchic frenzy, Plato proceeds to apply the theory of this process to education, seeking to avoid occasions of sorrow and fear altogether, as well as to strengthen the habits of cheerfulness and courage.

<sup>12</sup> Meno, 80a.

<sup>13</sup> Republic, 399c-d.

those who have need of gods and mysteries, because they are divine. But you produce the same effect with your words only, and do not require the aulos; that is the difference between you and him. When we hear any other speaker, even a very good one, he produces absolutely no effect upon us, or not much, whereas the mere fragments of you and your words, even at second-hand, and however imperfectly repeated, amaze and possess the souls of every man, woman, and child who comes within hearing of them. And if I were not afraid that you would think me hopelessly drunk, I would have sworn as well as spoken to the influence which they have always had and still have over me. For my heart leaps within me more than that of any Corybantian reveller, and my eyes rain tears when I hear them. And I observe that many others are affected in the same manner. I have heard Pericles and other great orators, and I thought that they spoke well, but I never had any similar feeling; my soul was not stirred by them, nor was I angry at the thought of my own slavish state. But this Marsyas has often brought me to such a pass, that I have felt as if I could hardly endure the life which I am leading (this, Socrates, you will admit); and I am conscious that if I did not shut my ears against him, and fly as from the voice of the Siren, my fate would be like that of others, - he would transfix me, and I should grow old sitting at his feet. For he makes me confess that I ought not to live as I do, neglecting the wants of my own soul, and busying myself with the concerns of the Athenians; therefore I hold my ears and tear myself away from him.14

Here we have a depiction both of the emotional potency of music and of the compound of seductiveness and knowledge. The passage is remarkable in the care with which it elaborates the details of its comparison; the madness of Alcibiades even contains a counterpart of the alcoholic stimulation that was combined with the music of the Dionysian rites.

The chief basis of Greek ethical views of music, however, is not magic and orgy, but the customary educational and social uses of the art. There is obviously an interrelationship between these fields of musical practice; the ethical value of music cannot be confined to formal education, for schooling simply foreshadows, or more usually echoes, life in general: the place of music in education should provide a view of its place in society, or in society as it once was or desires itself to be. And at the same time, social occasions not explicitly defined as educative may be of the greatest significance in molding ideals and character.

Even though they can be distinguished readily from magical and orgiastic effects, the values of musical practice have some basis in religion and rite, for music is invariably the main constituent of commemorative ritual. Celebrations of heroes or of important historical events are intrinsically educative ceremonies. Participants come to know the ideals of society as these are manifested in deeds and in men; they learn to admire and to emulate particular virtues and moral characters. The

<sup>&</sup>lt;sup>14</sup> Symposium, 215b-16b. The translation is by Jowett.

whole process takes place by means of music; cultural values are embodied in words, dance, and melody, becoming the basis of specific musical genres — of closely defined styles and types of melody with particular ethical natures. And ritually significant music of this kind has divine sanction as well; the commemorated event has the approval of the gods, one of whom, especially involved, may even supply the melody or the appropriate instrument. Divinely originated, music must then be preserved and refashioned by successive composer-performers who take up each defined occasion of use. Even to the auditors, the strength of the effect is far above that of absolute music; it is not possible to comprehend such an ethical world from the vantage point of pure art. In the characteristic Greek setting, music is given the utmost force by social tradition and religious belief, and the concreteness it assumes is due ultimately to its real context of community ideals as concentrated in the decisive historic event that in part brought them about and at the same time exemplified them most fully for the edification of future generations. The music in question here is actually a representational art of rhythm: music-poetry-dance. Hellenic theories of musical ethics are generally concerned with music in this fuller form.

The component arts were on occasion separated, of course, although much less often and much less completely than we might think. If unaccompanied dance existed at all, it was not of much importance, while pure instrumental music was not only relatively unimportant, but also either explicitly programmatic or doubtless in its form, melody, and rhythm especially full of meaning derived from visual and verbal and kinesthetic experience. On the other hand, singing and speaking are very close in all ancient civilizations, very much as they are in primitive cultures; the two verbs themselves are coupled or used interchangeably, and in numberless literary descriptions we cannot tell whether speech or song is in question. This ambiguity has a counterpart in the indeterminate nature of much preserved Greek poetry, for which melody, like dance, was unrecorded, although the euphony of the language, the qualities of the feeling expressed, and especially the meter, will often point unequivocally either to speaking or to singing. The complex relationships of duration can be such as to make spoken performance out of the question unless we are to omit completely the rhythmical features of the music (along with the melodic ones); the durations can be measured only by means of the precise power of temporal judgment that we can secure through tone. In its original forms, poetry was invariably musical. The epic incorporated heroic ballads sung to the lyre, and every part of it doubtless was

intoned in some fashion even as late as classical times. Elegiac and iambic verse were also initially sung, accompanied by the aulos and the lyre respectively. Aeolian monody and Dorian choral poetry remained truly melic arts, choral song encompassing dance also as a regular constituent. Later centuries had no parallel for Greek melic poetry, which, as it has come down to us, is only too obviously a torso. The drama too, derived from the cult of Dionysus, was sung to a great extent, incorporating both solo and choral song, along with dance. Only with the new dithyramb of Phrynis and Timotheus did music begin to undergo a fateful and irreversible fractionation in which its unity was forever lost. The complete combination of poetry, melody, and dance, however, was the ideal type of music as well as the predominant type; and it must therefore be our point of reference in the study of both Greek music and Greek poetry. But we have not fully accounted for the connection of the musical arts unless we realize that their separation is often more apparent than actual. Performance intermediate between speech and song was undoubtedly prevalent, in the form of chant or recitative or intonation, and the Greek language was in any event remarkably physical and measured. It could never lose an inherent music which was characterized by precisely defined durations.

The comparison of choral poetry to a mosaic has justly gained a certain currency:15 the Greek syllables are like unalterable stone tiles which are assembled contiguously in intricate successions of length. In sharp contrast is the fabrication of poetry out of the aura of feeling and fancy that surrounds words: the result here is an intangible play of meanings supported by the punctuation of accented points in a pattern made up of silence as well as sound. If Greek poetry is much more physical than this, it has its place appropriately in a literature that, even after the coming of prose, was conceived for oral delivery and almost always heard rather than read. Each tone, also, was ideally coupled to a gesture; the melody was mirrored in bodily motion. The very term choros meant round dance with song, and the concrete nature of Greek music is revealed even in the fundamental units of rhythm, which are not abstract durations of given length, but are defined as steps and syllables — as physical facts or events. But still more fundamental than physical motion is the word; Greek music worthy of the name necessarily involves language. Wordless music is regarded as inferior, and instru-

<sup>&</sup>lt;sup>15</sup> See, for example, the interesting study by Thrasybulos Georgiades, *Der griechische Rhythmus; Musik, Reigen, Vers und Sprache*, Hamburg, 1949 (or the reworked English version, *Greek Music, Verse and Dance*, New York, 1956).

mental performance can be distinguished as technē (which is in no wise different from craft since it lacks imitative capacity) from the more elevated mousikē, which generally designates vocal music. There can be no doubt that the union of melody with word and gesture produced an art of extraordinary definition, especially since the uniting factor, rhythm, was identical in all three components; there was not a complex interplay of three patterns, but a single rhythmic expression, which was apparently the most important aspect of Greek music. Nor was this rhythm in itself a layered construction, as in the rhythm of an 18th- or 19th-century melody, where the sounded pattern is heard against an implied but inaudible measured background. And the unity of Greek rhythm was further solidified by unison singing and "unison" dancing; thus Greek music is comparable to Greek statuary and architecture in that it possessed a remarkably definite physical character.

The imitative nature of music, its unified concreteness, and its ethical force are all importantly interrelated, and it is only through an awareness of their interconnection that we can secure an insight into the musical ethics of antiquity. If the basic task of music is the production of a likeness, for example, it is understandable that melody must not be separated from words, for then its imitative capacity would decrease and its meaning would become vague. Also, it is the power of music to imitate virtue that explains its capacity to influence and mold character. Thus the conception of imitation acts as an intermediary between the concrete nature of music and its ethical effects, and undertakes to explain how the one can bring about the other. This whole circle of notions is not so restrictive a characterization of art as it might seem; for one thing, the Greek concept of imitation actually includes the general notion of formative activity in itself and of the synthesis or simulation of appearance apart from reference to a model. But even if we take mimesis in its specifically imitative sense, it is apparent that the matter to be imitated can be very diverse, extending from visual objects to character and even to the idea of virtue itself rather than its particular manifestations. The imitation of character by music has a very definite sense in the literal imitation of the speech and behavior of a person by means of vocal music and gesture, particularly in the portrayal of character in drama. This is as concrete as or really more concrete than imitation in sculpture and painting. Greek music was an imitation, however, less of visual appearance than of disposition or temperamental nature, expressed most typically in measured language and tone. But by virtue of a rapprochement between musical theory and harmonic metaphysics, it also enjoyed

the privilege unique among the arts of imitating divine and ideal order; and as a manifestation of this order it is capable in Plato's *Timaeus* of leading man to virtue and knowledge as directly as the more literally conceived imitations of the *Republic* are able to inculcate the more specific virtues of valor and temperance. Music in the *Timaeus* is thought of as a purely tonal art;<sup>16</sup> all that matters is its ability to reflect the abstract values of noetic harmony; its slight imitative capacity in the absence of words and physical gesture has ceased to be of interest. Partly as a result of the diversified nature of musical imitation, the ethical aspects of music have an impressive scope, ranging from medical cures to an influence on the feelings, from the precept and moral example contained in sung words to the most pervasive and powerful effects on behavior and character.

Throughout the gradual redirection of Greek ideals from the physical to the intellectual, from the hero in combat to the philosopher and orator, poetry and music continued to occupy a position of the utmost importance both in formal education and in the various educative occasions of life.<sup>17</sup> The great diversity of the ethical effects of music seemed to endow it with value for every task. Even apart from the question of imitation, instruction in music has always been an essential part of an aristocratic ethic; from Homer to the European Renaissance, instrumental performance and song and dance have been indispensable accomplishments of the knight and the courtier; they are part of the whole aristocratic pattern of life. The ritual observances of the knightly culture depicted by Homer made use of religious choral dance-songs, but ethical values can be found also in the individual dancing and singing and lyre-playing that served as entertainment, for prominent in this secular sphere was the rehearsal in song of great military exploits. Singing such heroic narrations was a private pastime of Achilles, and there can be no doubt of their moral influence. We know also of the ceremonial music at funeral games, which in an ethical respect would appear to stand somewhere between the religious paean and the heroic ballad. The description in the

<sup>16</sup> Timaeus, 80a-b. Because instrumental music lacks imitative power, it readily becomes either dedication to pleasure as opposed to good, or a manifestation of harmony, which makes it morally significant and at the same time a sensuous approximation of scientific knowledge.

<sup>17</sup> Important recent histories of ancient education are Werner Jaeger's Paideia; The Ideals of Greek Culture, New York, 1943-45; Henri Irénée Marrou's A History of Education in Antiquity, transl. by George Lamb, New York, 1956; and François Lasserre's L'Éducation musicale dans la grèce antique, in his Plutarque; De la musique, Olten and Lausanne, 1954.

Iliad of specifically educational activities in the case of the tutors Chiron and Phoenix supplements the general picture: education revolved around courtly accomplishments, which included training in song and dance and lyre-playing as prominent features, and around the heroic deed, which was inspired by great models of the past. It is this idea of glory achieved by valor that was central in the life of the Homeric noble, and that was fostered by the Iliad and the Odyssey themselves in their long history as the fundaments of Greek education. The events of the Iliad itself look back to still older prototypes; this is the heart of the process through which the culture secures continuity; and very much as the actual educational use of the heroic ballad is described in the epic, so the epics in turn, originally themselves sung, became the examples furnishing moral inspiration to successive generations. Also, the glory to which the hero aspires and for which he is willing to sacrifice his life is really a musical one, for it consists in the poetic celebration that immortalizes his deed. Of this, again, the *Iliad* both relates examples and is itself the greatest example. Thus in the Homeric world, music and poetry have their highest function in the glorification of the hero and in an education that is based on this. And they employ an appropriate educational method, for by lending glory to some past exploit they turn it into an ideal of action and thus arouse the very competitive spirit that impels the hero to excel in battle.

The ethical functions of the Homeric epic were time and again adopted and modified by later Greek poetry, and the ideals it expressed never ceased to be an inspiration. An educative intent became common, manifested in a protreptic or admonitory tone and associated with the direct address of the poem to a particular person. The catalogue of maxims was a characteristic poetic genre. Most important of all was the continual concern with ideals and virtue, with the expression of the highest values of the poet and his culture. On occasion this took the form of a detailed code of behavior. Hesiod's Works and Days represents an early transformation of the epic in which the form is explicitly didactic and the concern is with the virtues of work and justice, values not of the aristocracy but of the Boeotian peasantry. An explicit moral intention became a conspicuous feature of the philosophic epic also, here connected with metaphysical truth. It is this whole poetic tradition that Socrates and Plato revitalize, and in their critical inspection of the nature of virtue, they logically review all the specific ideals of the poets. To the ethical influence that poetry exerts through its meaning, however, we must add its ability to reinforce the values that inhere primarily in a situation rather than in the words themselves; the occasion of performance takes on increased significance and moral influence.

The elegiac poetry of Tyrtaeus advanced a changed ideal of heroism that applied to the soldier of Sparta in the seventh century B.C. Every warrior in the ranks became a hero, not only the great individual engaged in single combat, and the goal was service to the community: the glory of the polis supplanted personal glory. At the same time, the powerful effects of the aulos and the marching-song were put to use in military music. In addition, music became an event of competitive games, alongside athletics, and in this way it provided a means of achieving that individual glory no longer a dominant factor in actual combat, or at least a means of combining personal and civic fame. Most important of all, musical ceremonies and festivals united the polis in a truly common religious experience. With Alcman towards the end of the seventh century, choral poetry became the characteristic musical expression of Sparta. Like the elegy, however, which originated in Ionia but in the work of Tyrtaeus and Solon and Theognis spread to all of Greece, Dorian communal poetry was by no means confined to Laconia, but was found also in Sicily, Boeotia, Ionia, and Athens. But as contrasted with the elegy, which taught by precept, and with the iambic, which made use of maxim, fable, satire, and invective, choral poetry taught largely by participation. Spartan festivals furnished the occasions for a wide variety of dancesongs devoted to specific deities and ranging from solemn processions to banter. Participation in any choral poetry meant dedication to a tradition, and could hardly remain without a strong ethical effect. Taken over from the epic was the typical religious-social function of praise, which made choral poetry characteristically hymnlike in nature. Praise could easily encompass commemoration of the dead or patriotic exhortation; it tended to absorb every social and ethical value. That it was a universal theme can be clearly seen in the Hellenistic division of melic poetry into three types, all of them concerned with praise and differing only in their objects: gods, gods and men, and men respectively. Starting in the middle of the sixth century, Spartan education assumed the form that became so well known and influential in later times; it became less intellectual, more strictly military, and increasingly resistant to change. Important in the subsequent history of musical influences are the military use of music for its directly stimulating effect, and the standardization of repertory that guarded traditional social and military values.

In contrast to the strong collectivism in Sparta, Greek culture elsewhere preserved much of the individualistic standards of older times.

The gnomic elegies of Theognis, for example, which were sung at symposia, conveyed explicit moral principles of aristocratic behavior. And up to the time of Plato, education was conducted very little in formal schools, but was based on an individual relationship, the love between master and pupil, which dominated the philosophic academy as well as private tutoring. In this lies its strength, and perhaps the ultimate reason for its vast influence on the course of educational history; instead of being a relatively superficial matter of imparting knowledge, it is a fundamentally moral undertaking of cultivating and molding character, of fashioning the whole person in accordance with a particular way of life. In such a framework the importance of music becomes more readily understandable. Before schools were public, they were for centuries societies of the elect, each pupil bound by personal ties to the master. Music took its part in a leisured and aristocratic life; but still more important was its role in ritual, which involved the age-old connection of music with knowledge, and more especially, with wisdom (which contains an ethical component). The philosophic school was dedicated to music, or we can equally well say, to culture. In the activities of the Pythagorean Brotherhood, music may very well have displayed the full variety of its ethical powers, many of them without any basis in imitation; it was a constituent of ritual, a medical purification of the soul, and even — in the form of theoretic and scientific study — a key to metaphysical knowledge; it was studied, that is, for directly philosophical and religious reasons, and not only employed in sonorous form for more palpable influences on health and piety. In the case of Sappho's school in Lesbos, there was continual use of music in periodic ritual and ceremony; and instruction in lyreplaying, singing, and dance was an important part of the curriculum. This implies a pervasive ethical influence; but the Sapphic fragments not only provide glimpses of the place of music in the school of the poetess: they are remnants of a potent art that was itself music and that brought to Greek consciousness many subtle shades of subjective experience. In this way, her poems possessed a broad educational value that extended far beyond her immediate circle.

But if the public nature of Spartan education contrasts with the aristocratic Greek tradition of private tutoring, another contrast is provided by Athenian education of the earlier fifth century, for this was civilian rather than military. But neither this significant change nor the growth of democracy radically affected the persistence of aristocratic values. These proved to be compatible with the ideal of social justice which the poetry of Solon had long before envisaged as a counterpart of the bal-

anced order of nature, and now valor and glory were retained in a civilian and democratic setting simply by transferring them from the battlefield to athletics. As a result, sport took on a new intensity, and the celebration of victory in the various games, especially as we see it in the victory odes, or epinikia, of Pindar, was of the highest dignity and impressiveness. But at the same time, the process of democratization presented a problem. Athletics was to a great extent open to all, and in the public school, which grew up side by side with individual education, aristocratic ideals and curricula were similarly adopted for common use. The outcome was a serious controversy, for the belief did not die that culture was a restricted phenomenon and education necessarily a selective matter. In any event, music retained its historical ethical role and its commanding status. As far as intellectual education was concerned — that is, apart from gymnastics — the chief mark of a cultivated man was the ability to sing and dance and play the lyre.

Outside the formal education of the schools, choral poetry continued to exert its powerful moral influence, especially in Sparta, while the drinking party, highly organized and probably the most important institution of Greek cultural life, provided a more restricted aristocratic class with training that was almost exclusively moral and almost exclusively musical. Dancing, and performances on lyre and aulos, were secondary to the skolion, in which each guest sang in his turn. A knowledge of poetry that extended from epic to lyric was a presupposition of such gatherings: Homer and Tyrtaeus and Solon and Theognis furnished an extremely comprehensive moral cultivation, in which the explicit teachings of elegiac poetry occupied a central position. It was the symposium that was mainly responsible for the preservation of an aristocratic ethic. Most importantly, the older choral poetry of Stesichorus, Alcman, Simonides, and Pindar — known to the cultivated man through his participation in choral song — came to be performed monodically, so that the symposium incorporated the ideals of civic education and ensured the continuity of the musical tradition of liberal studies.

Prior to the Sophists and Socrates, Greek education was in general more physical and moral than it was intellectual, and it consequently made use more of actual music than of music as a theoretic and philosophic study. As a reflection of aristocratic ideals, it really never lost its liberal interests and its distrust of occupational training, and it aimed at cultivation for a leisured way of life compounded of sport and intellectual pleasures, with political activity as the typical serious pursuit. But in the later fifth century, education took on a more purely intellectual

intensity and a new ideal of wisdom. The scientific and philosophic aspects of music grew in importance alongside of practical music and for the most part unrelated to it. In this change, the philosopher supplanted the poet as an educator, and we can consequently see a particular logic in Plato's designation of philosophy as the highest music. But as philosophy was music in an abstract sense more than an actual one, so the educational ideal it advocated was more one of musical science than of practical music. The stress on intellectual education did not necessarily involve a discard of ethical cultivation, however, but only a change in standards. Practical music was reinterpreted as a preparation for the rational training that came afterward, although its direct social and moral values were not overlooked. Much of the new outlook had been anticipated long before by Xenophanes: he turned to poetry rather than prose as a philosophic medium, he recited at symposia, thus usurping the position of the poets, he took direct issue with Homer in much the terms Plato did, criticizing him as immoral, and he advanced an intellectual rather than a physical ideal. More subtly, Plato reduces gymnastics to a matter affecting the soul rather than the body; 18 but he by no means loses sight of its inherent values, and seeks only to turn them back to their older significance as preparation for battle rather than for victory in athletic competition. Almost symbolically, in the Symposium, he explicitly relegates music to the category of entertainment,19 while the time of the company is spent in the higher activity of philosophical discussion, the new and superior kind of music. This is doubtless a conscious depiction of new educational ideals, which Plato was quite ready to view from a musical standpoint. With the Sophists, relativism could easily lead to a discard of music as an ethical force; in the world of dialectics and oratory that they created it was to be retained only as an emotional and technical aid to the speaker. But the renewed faith of Socrates and Plato in an absolute moral standard brought with it a belief in the older ethical values of music and in musical value in general. Yet the nature of music was changing, and as the old unity fell apart the educational ideals and curriculum based on it changed also; political and social changes were a counterpart — or a result, as Damon and Plato believed; the logical outcome was the destruction of the polis and the growth of the cosmopolitan city, a process accompanied by an equivalent disruption of music. In attempting to reinterpret and

<sup>&</sup>lt;sup>18</sup> Republic, 410c-12b.

<sup>&</sup>lt;sup>19</sup> Symposium, 176e. See also Protagoras, 347, where the entertainment furnished by girls who dance and play the aulos and lyre is similarly set aside in favor of discourse.

preserve the older ideals, Plato found himself opposed to what was actually a more progressive attitude, for philosophy fought with rhetoric over the educational leadership abandoned by music, and rhetoric frankly accepted the musical disintegration and the new intellectual specialization, replacing universality with versatility.

In any event, the musical-poetic tradition reveals that the educative function of music exists in poetry of whatever type, although the precise function varies with the genre. The teaching values of gnomic verse are there for all to see, but even the philosophic epic evolved from the didactic epic, and traces of its origin are still evident in so late a descendant as Lucretius. The motif of moral instruction, intimately allied to music, runs through the entire history of Greek poetry and philosophy, and indeed through all the literature of antiquity. In its direct address to a single individual, the prose protreptic continues the manner of didactic and moral poetry; philosophy has already adopted the device in Empedocles's time, and with Isocrates it becomes an established genre. The Epinomis (intended as a final section of Plato's Laws), Aristotle's Protrepticus, Cicero's Hortensius, Boethius's Consolation, and the patristic "Exhortation" are outstanding examples. But vastly more impressive than the explicit exhortation is the Platonic dialogue itself, with its powerful inspirational effect. The education of Greece was the high ethical purpose that philosophy carried over from poetry, and if Homer was the teacher of Greece, Plato became the teacher of the West. But in its superior realization of this purpose, philosophy directed towards poetry not gratitude but criticism. For poetry did not deal in abstract argument; it made use of feelings and the concrete instance. Furthermore poetry was degenerating, in Plato's opinion; it had lost sight of its social mission, while those participating in it became effeminate and depraved. The actors in Athenian tragedy stood on a plane vastly inferior to that of the participants in Dorian choral dance. It was symptomatic that the aulos had taken on a new popularity, and ornate musical styles had appeared, in conjunction with virtuosity and purely instrumental music.<sup>20</sup> Imitation ran riot, Plato tells us, with attempted duplications of the sounds of nature and animals and various musical instruments; the citharoedic singer imitated the quavering excitement of the aulos; modulation, chromaticism, and a mixture and confusion of styles accompanied a continuous search for novel effects, and music was dedicated to senseless pleasure and applause.

<sup>20</sup> Laws, 700a-01c, provides a picture of the moral decay of music and its repercussions in the earlier fourth century. See also Republic, 700a-b.

The ethical values of poetry became an important issue in the case of Athenian tragedy, and indeed were the core of the controversy over the relative merits of Aeschylus and Euripides. In the Frogs of Aristophanes, Aeschylus rehearses the traditional moral and social function of the poet: "Those are the subjects that poets should use. Note how useful, even from remotest times, the poets of noble thought have been! Orpheus taught us the mystic rites and the horrid nature of murder; Musaeus, the healing of ailments and the oracles; Hesiod, the tilling of the soil and the times for delving and harvest. And does not divine Homer owe his immortal glory to his noble teachings? Is it not he who taught the warlike virtues, the art of fighting and of carrying arms?"<sup>21</sup> And in answer to a question about the truth of a story used by Euripides, he says, "No, the story is true enough; but the poet should hide what is vile and not produce nor represent it on the stage. The schoolmaster teaches little children and the poet men of riper age. We must only display what is good."22 Truth is not an adequate standard of poetic value, then, a concept that Plato develops in detail.

It is clear at the close of the play that Aeschylus carries the day precisely by virtue of his social role. Aristophanes takes the occasion to criticize Socrates also, whom he treats as the representative of rhetoric, for engaging in idle talk — that is, in an activity not socially useful. Even the medical power of music is wielded by Aeschylus, as it is by Musaeus in the passage cited above. "Let us beware of jabbering with Socrates," the chorus sings, "and of disdaining the sublime notes of the tragic Muse. To pass an idle life reeling off grandiloquent speeches and foolish quibbles, is the part of a madman."23 And Pluto continues: "Farewell, Aeschylus! Go back to earth and may your noble precepts both save our city and cure the mad; there are such, a many of them!"24 In the Clouds, Aristophanes paints a vivid picture of the immoral and outrageous results of sophistical education; yet however mistaken it may be in its attribution to Socrates and however ludicrously distorted, it really has a foundation of truth in the dangerous ethical relativism of the Sophists.25 As a poet, Aristophanes will naturally prefer poetry to rhetoric, but his true motives go beyond this, as we can see in his detailed criticism of Euripides. For

<sup>&</sup>lt;sup>21</sup> Aristophanes, Five Comedies, Cleveland, 1948, p. 272.

<sup>22</sup> Ibid., p. 273.

<sup>&</sup>lt;sup>23</sup> *Ibid.*, p. 287.

<sup>24</sup> Ibid., pp. 287-88.

<sup>&</sup>lt;sup>25</sup> This can be seen clearly in the intransigent and rebellious views defended by Callicles in Plato's Gorgias, 482c-84c.

Aristophanes is not only the greatest of craftsmen; he is a defender and representative of the high ethical mission of his art.

Pindar, who was a contemporary of Aeschylus and, with Theognis, the chief champion of the great aristocratic tradition, gives us our deepest insight into the cultural force of music in a commemorative context. Not only are his odes themselves music, actually serving the high purpose to which choral dance was dedicated, but they often explicitly describe music in its central religious and social function. In the twelfth Pythian Ode we are fortunate in having an epinikion honoring an aulos player; the Pythian games included music as a field of competition. The poem is a rich tapestry of meanings, wonderfully interwoven.<sup>26</sup> There is an invocation to the Greek colony of Agrigentum, in Sicily, for this is the home of the victor, Midas. Then the myth of Athena's invention of the aulos is told: how Perseus beheaded Medusa, and how Athena heard the mournful cries of Medusa's sisters and invented the "manyheads melody" in imitation of them. Breath flows through the aulos reed, mirroring the action of the human voice. The reed has grown in a holy region near the city of Charites, which is known for its beautiful round dances; thus it has always looked upon dancing as it is doing on this occasion. There is a moral also: as it always has in the past, success comes only with effort and with divine aid.

Music has a remarkably elaborate significance in this ode; it permeates every value, ennobling hero, city, ritual, and tradition. The aulos is physically part of the ceremony of celebration, but it is also discussed in the poem itself; its reed has come from a land devoted to dance. And the victor's glory is really the glory of the city, but it is given still deeper meaning by the divine origin of the instrument and the melody-type: Midas is something like the priest of a specific musical ritual. Choral dance is basically religious music, and thus naturally encompasses both myth and moral teaching. In all the longer odes myth occupies the central part, tied somehow to the victorious occasion, either to the hero, to his family, or to his city and its particular gods and heroes. It is really only in this reference to current occasions and places that the epinikia differ from the dithyrambs. Thus both music and life are given depth and meaning; they are viewed as continuous with a sacred tradition extending into a divine past.

It becomes especially evident here that the ethical force of music derives from its religious and social nature, which is manifested both in its ritual importance and in its public and patriotic functions. Choral song was the heart of the Pythian games, and the drama an essential feature

<sup>&</sup>lt;sup>26</sup> See the discussion in Georgiades, Greek Music . . .

of the Dionysian festivals. Furthermore, in its content, Greek literature almost always has a social orientation; the isolated individual, like the autonomy of art, hardly had a meaning. Consequently the poet was not just a national hero as an artist, but was regarded literally as a teacher and leader, and at times as a prophet. Plato is not simply being contentious when he demands an active political or social role from the poet before he will consider him a worthwhile member of society.<sup>27</sup> An outstanding example of the poet as a leader — and of the practical import of morality in poetry — is that of Solon, the great statesman of Athens; and it is obvious that the numerous tales of poets in the guise of rulers and peacemakers, like the stories of Sparta's repeated recourse to musicians in hours of need, cannot be totally without foundation. Thus when philosophy and oratory laid claim to teaching and to leadership, they could do so only in a conscious attempt to fill the role of poetry. Plato's dispute with the poets and the rhetoricians revolves to no small extent around the educational value of these rival pursuits, although, to be sure, possessing both poetic genius and an incredible mastery of rhetoric, he is easily able to carry off the victory.

But music does not merely present conceptual material to the intellect; it molds character more directly in the psychological impact of its rhythm and meter and melody, and more forcefully still in the fact that choral dance-song compels participation, calling for musical performers who also must take part in a ceremonial experience. This is in particular the Dorian tradition of music, exemplified by Sparta; it is the great Grecian ideal that Plato unhesitatingly adopts. Compared with it all other varieties of art shrink to insignificance: the tragedians have come to pander to the public, instrumental virtuosity is directed solely to pleasure, the monodists are lascivious, art in general is false and corrupting.

There can be no doubt that every element of music contributed its share to the whole ethical quality.<sup>28</sup> The moral content of the words was reinforced by bodily movements, by meter and melody of the same quality and character, and by an appropriate tempo. Even in isolation, each component would have something of the same nature as the whole,

<sup>&</sup>lt;sup>27</sup> As an imitator alone, the artist has little claim to respect; if he really understood the objects he imitated, he would devote himself to them and not to art. See *Republic*, 597d-602c.

<sup>&</sup>lt;sup>28</sup> Even though issue can be taken with it in some respects, Hermann Abert's study of the ethical character of the various constituents of Greek music, *Die Lehre vom Ethos in der griechischen Musik*, Leipzig, 1899, is still a basic and definitive collection of the evidence, most of it unfortunately from post-classical sources.

and would express the same feeling and have the same effect, albeit in less precise and powerful form. What remains of Greek music permits us to verify this only for meter; melody and gesture have disappeared with hardly a trace. Only theoretical discussion of musical ethos opens to us something of the specific capabilities of various scales and types of melody and dance. But in the application of meter to reflect the moral nature of ideas we have a storehouse of practice that helps to round out technical and esthetic discussion; and it becomes clear that each variety of meter has its own ethical nature which helped it to define a particular genre of poetry to begin with, so that poetry and drama slowly develop a stock of moral and expressive values. The ethos of meter becomes particularly prominent when the nature of the poetic genre permits combinations of different metrical types or the construction of new ones, as is conspicuously the case in dramatic composition, which is not only analogous to "panharmonic" music but liable to the same Platonic criticism of playing a wanton game with human feelings rather than inculcating the pattern of officially approved virtue. Dochmiac meter had an effect of anxiety or despair, anapaestic one of dignity, the paeonic was excited, the epitrite grave. Some meters were obviously capable of a variety of effects, even apart from tempo, which of course would always be an influential factor. Also, metrical composition, like melodic, could involve complex and individual constructions for each work, as it does in Pindar. The musical genius of the composer might arrange long and short syllables and syncopations without the guidance of theory, but in quite the same way as it arranged the constituent pitches and intervals in a melody.

Both the technical theory of musical ethics and its general moral and social philosophy were formulated towards the middle of the fifth century B.C. by Damon,<sup>29</sup> an Athenian philosopher and musical theorist. This influential man was a pupil of the Sophist Prodicus, an adviser of Pericles, and a teacher of Socrates, but in spite of his importance, our knowledge of his ideas is due almost exclusively to fragments of an oration, his *Areopagitikos*, and to several references to him by Socrates and Plato, who speak of him with the greatest respect. The discovery and analytical application of the metrical foot seem to have been his work, as well as contributions to the system of the *harmoniai*. Ethically

<sup>29</sup> See Franz Buecheler, Hoi peri Damona, in Rheinisches Museum 40, 1885; Karl von Jan, Damon, in A. Pauly and G. Wissowa, eds., Real-Enzyklopädie der klassischen Altertumswissenschaft, Stuttgart, 1893ff.; Heinrich Ryffel, Eukosmia; Ein Beitrag zur Wiederherstellung des Areopagitikos des Damon, in Museum Helviticum 4, 1947, and Lasserre, op. cit., pp. 53-79.

he was concerned with the effects of various rhythmic and melodic patterns upon human nature, and set up typologies of rhythms and modes and characters. He was the leading authority in the field of the specific moral effects of music, maintaining also that there was an indissoluble connection between music and society, so that musical changes inevitably entailed legal ones. The thesis of his oration was undoubtedly that the guardianship of good law and good order should remain as the function of the Areopagus, the oldest and most distinguished of the Athenian tribunals, and that this function was best discharged through music, which in affecting the human soul could similarly affect the soul of the state — its laws and political constitution.

When Athenian philosophy concerned itself with the teaching of virtue, it naturally had to come to terms with traditional and current conceptions of education, which were represented chiefly by the Sophists. Training in music and gymnastic were prescribed by law,30 and the great Sophist Protagoras, in contrast to the later representatives of his profession, believed in the value and strength of musical influences. In the dialogue of Plato named for him, Protagoras is interested in demonstrating that virtue can be taught, and he appropriately recounts the whole customary course of education.31 He describes epic poetry's admonitions, praises, and encomia of ancient famous men which the child must learn by heart so that he may imitate or emulate them and desire to become like them. And he discusses also how the child learns lyric poetry and its accompaniment by the lyre, which makes the harmoniai and rhythms familiar to his soul, thus teaching him to be more gentle, harmonious, and rhythmical. Then gymnastic is used to strengthen his body, so that it may better minister to his virtuous mind.

It is only in the writings of Plato and Aristotle that we come upon an elaborated ethical theory of music, along with a detailed educational program; but a consideration of the final impressive products of Hellenic musical thought falls outside the scope of the present discussion, which seeks only to expose the foundations of the Platonic conceptions by examining the nature of Greek musical practice together with what little can be discerned of earlier speculation. It may be mentioned by way of conclusion, however, that the Platonic moral and social philosophy of music is by no means a clear and coherent whole; perhaps because of its vast scope, much is omitted and unexplained. The relations between the moral values derived from imitation and those derived from harmonic

<sup>30</sup> Plato, Crito, 50d.

<sup>31</sup> Protagoras, 325c-26e.

structure, between the dangers and the benefits of imitation, between vocal and instrumental music, between the educational advantages of musical practice and those of musical theory, between the ethical and esthetic aspects of the effect of music, all present problems of considerable difficulty. In their solution, a study of the sources of Plato's musical ideas will be an indispensable aid.<sup>32</sup>

<sup>&</sup>lt;sup>32</sup> A comprehensive examination of Hellenic musical ideas will be included in my forthcoming book on ancient conceptions of music.



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## MUSIC AND PERCEPTION: A STUDY IN ARISTOXENUS

Familiar and important though Aristoxenus is to students of Greek music, philosophers, so far as I can judge, have not always given him a fair run for his money. No one would call him a great philosopher; but his arguments illuminate important aspects of the controversies of the late fourth century, and reflect light backwards onto the different views not only of music, but also of science in general, which had been held and argued over during the previous hundred years. Nor is he merely a referee in other men's contests: his ideas have a philosophical as well as a musical originality which deserves recognition. Plainly a single paper cannot hope to cover all the philosophically important aspects of his work, and I have chosen one topic which I take to be central, his conception of the relations between music and  $a\tilde{a}\tilde{b}$ 

More precisely, I shall be concerned with his views on the role of  $ai\sigma\theta\eta\sigma is$  in determining the nature of  $\dot{a}\rho\mu\nu\nu ia$ .  $\dot{a}\rho\mu\nu\nu ia$  is not the same thing as music, but is a part of it, as for instance is rhythm:<sup>2</sup> and it so happens that  $\dot{a}\rho\mu\nu\nu ia$  or  $\tau\dot{o}$   $\dot{\eta}\rho\mu\nu\sigma\mu\dot{e}\nu\nu\nu$  is the main subject of those passages of his work which have come down to us in completest form, under the general heading of  $\dot{a}\rho\mu\nu\nu\nu ia$  orouxeia, Elementa Harmonica.<sup>3</sup> It should be understood that the term  $\dot{a}\rho\mu\nu\nu ia$  does not mean the same as our 'harmony'. There are various things which it can mean, particularly the tuning of an ordered scheme of intervals forming the basis for a musical scale:<sup>4</sup> and here, by extension of the notion of a scale as a permissible sequence of intervals, the title  $\dot{a}\rho\mu\nu\nu\nu\kappa\dot{a}$   $\sigma\tau\nu\nu\chi\dot{e}ia$  is probably best understood as 'elements (or principles) of melody'—what makes this, but not that, a tune. For Aristoxenus, as for—say—the 'classical' composers of the eighteenth century, there are certain sequences or arrangements of notes which are melodically possible and others which are not: and in broad terms his question is what the principles are in virtue of which this is so—what is involved in the structure of a proper  $\mu\dot{e}\lambda\nu\sigma$ , what is a musical sequence and what is not, and why.

It may be useful for me to explain in advance a few fairly elementary points about what the theorists discerned as the structure of the music of this period, and the terminology which Aristoxenus and his contemporaries used to discuss it. I shall need to say something about scales  $(\delta \rho \mu o \nu i a)$ , the description of notes in scales, and about what Aristoxenus calls  $\gamma \epsilon \nu \eta$ .

In the Greek scales, as Aristoxenus discusses them, certain notes are 'fixed'—that is, whatever the scale, these elements of it stand in invariable intervallic relations to one another (cf. e.g. 22). 5 For simplicity's sake (and following Aristoxenus's procedure in much of the work) I shall restrict the scope of my examples as far as possible to one segment of the scale, that extending from the note called  $\mu \acute{e}\sigma \eta$ —in some sense or other a basic or fundamental note6—down a fourth to the  $\mathring{v}\pi \acute{a}\tau \eta$ .  $\mathring{\mu}\acute{e}\sigma \eta$  and  $\mathring{v}\pi \acute{a}\tau \eta$  are fixed, always a fourth apart. Between them lie two notes,  $\pi a \rho v \pi \acute{a}\tau \eta$  and  $\mathring{v}\pi \acute{a}\tau \eta$ , and these are not fixed. Though any scale, going down from  $\mathring{\mu}\acute{e}\sigma \eta$ , goes  $\mathring{\mu}\acute{e}\sigma \eta$ ,  $\mathring{v}\iota \chi a v \acute{e}\sigma \iota \eta$ ,  $\mathring{v}\pi \acute{a}\tau \eta$ ,  $\mathring{v}\pi \acute{a}\tau \eta$ , and covers a fourth in doing so, the intervals between the notes within the tetrachord are variable, and with certain systematic kinds of variation in these intervals we get what Aristoxenus calls change of  $\mathring{v}\acute{e}v o \iota \iota \iota$ . There are three such  $\mathring{v}\acute{e}v \eta$ , diatonic, chromatic, enharmonic (cf. e.g. 44), and through appropriate changes in the relevant intervals, the tetrachord can be converted into a segment of a scale in any of them. It is also possible, as we shall see, to admit

- <sup>1</sup> Historians of philosophy have tended to see him primarily as a source of information about other philosophers, particularly Pythagoreans. To take a more or less random sample of the standard authors, Robin barely mentions him, Zeller gives him a few pages, couched in very general terms, and Gomperz ignores him altogether.
- <sup>2</sup> Cf. Plato Rep. 398d 1-2, Aristox. El. Harm. 1, Ps.Plutarch de Mus. 1142f.
- <sup>3</sup> The three books of the Elementa Harmonica as we now have them do not form a single unified work. For an account of opinions and arguments concerning their nature and relationships, see R. da Rios, Aristoxeni Elementa Harmonica (Rome 1954) Prolegomena IV, cvii—
- <sup>4</sup> Originally the tuning of the strings of the lyre: cf. Heraclitus fr. 51: derivatively, the special varieties of tuning which form different classes of scale, including those associated with the names of the so-called 'modes' in Rep. 398-400. Cf. Ar. Pol. 1276b8 and elsewhere. See also e.g. I. Henderson, 'Ancient Greek Music' in the New Oxford History of Music (Oxford 1957) i 347-9, 384 ff.
- <sup>5</sup> Numbers in brackets in the body of the text refer to sections of Aristoxenus *El. Harm.* The two most useful editions are by H. S. Macran (Oxford 1902) and R. da Rios, cited at n. 3 above.
- <sup>6</sup> See for instance Aristotle's rather obscure remark at *Met.* 1018b29. Other useful passages may be found cited s.v. in LSJ.

minor variations on these intervals within a  $\gamma\acute{e}\nu os$ —e.g. raising or lowering the relative pitch of the  $\lambda\iota\chi\alpha\nu\acute{o}s$  by a very small amount—thus giving what are called different 'shades',  $\chi\rho\acute{o}\alpha\iota$ , of the  $\gamma\acute{e}\nu os$  (24–25, 49). These possibilities are central to my argument, as are the senses in which a note, moved up or down to function in a scale of a different  $\gamma\acute{e}\nu os$  or  $\chi\rho\acute{o}\alpha$ , remains despite its new pitch the same note ( $\phi\theta\acute{o}\gamma\gamma os$ ).

The questions I want to discuss take us beyond pure musicology and into philosophy. Aristoxenus is not simply investigating agreed phenomena in standard ways: he is expressing, and vigorously arguing for, a particular conception of what music is, and in what the science of the study of music properly consists. He shows marked antagonism to views which differ from his own, notably those of the Pythagoreans and some persons whom he called the  $\delta\rho\mu\nu\nu\kappa\rho i$ , and he is equally willing to enter disputes with both Plato and Aristotle. He in fact finds no one to agree with, and is jealous of his picture of himself as an innovator.

Aristoxenus' account of the relation between music and  $\alpha i\sigma\theta\eta\sigma is$  is at the heart of his general position. I shall argue that the new understanding of the nature of music and its principles to which it leads—for I think that it is an innovation—is fruitful and attractive; but also that it generates difficulties from which I am not sure that he can disentangle himself.

Aristoxenus refers frequently and with emphasis to music as an  $a l \sigma \theta \eta \tau \delta v$ . We shall best find out what this is supposed to mean by looking at his attacks on those of his rivals and predecessors who are represented as somehow denying it.

In section 32 he poses as his general question περὶ μέλους παντός, πῶς ποτε πέφυκεν ἡ φωνὴ ἐπιτεινομένη καὶ ἀνιεμένη τιθέναι τὰ διαστήματα: that is, in what natural or proper order of intervals a melody can move upwards and downwards. The ordering of this movement is a matter of natural law (φυσικὴ κίνησις), and is not merely random; and in his account of it he will try to offer ἀποδείξεις ὁμολογουμένας τοῖς φαινομένοις. I shall say more later about what this means. For the present let us concentrate on his contention that in this respect he differs from his predecessors. Some of them, he says, ἀλλοτριολογοῦντες—that is, introducing extraneous or irrelevant reasoning—and rejecting αἴσθησις as inaccurate, invented 'rational' principles (νοητὰς αἰτίας) and asserted that height and depth of pitch consist in λόγους τινὰς ἀριθμῶν and τάχη πρὸς ἄλληλα, relative 'speeds'. In doing this, Aristoxenus complains, they are ἀλλοτριωτάτους λόγους λέγοντες, and making assertions ἐναντιωτάτους τοῖς φαινομένοις.

We have two accusations, then: that of introducing extraneous reasoning or irrelevant conceptions, and that of making assertions contrary to the  $\phi a \nu \delta \mu \epsilon \nu a$ , the 'appearances', whatever exactly it is that Aristoxenus wishes to indicate by this term.

As regards the first of these, it is pretty clear in rough outline what he means, though we shall be able to fill it in more precisely as we go along. Music is something which we hear. Height and depth of pitch are perceived qualities of sound, and need to be investigated as such. They are not rates of vibration, or of any other kind of physical movement, and they are not numerical ratios. Here it is worth briefly focussing on another passage (8–9), where he is trying in a preliminary way to mark off musical sounds from others. Non-musical sound, and in particular speech, moves up and down in pitch  $\sigma u \nu \epsilon \chi \hat{\omega} s$ , continuously; whereas musical sound moves by intervals, remaining stationary at the points of arrival between leaps. Now this account, he says, is to be taken  $\kappa \alpha \tau \hat{\alpha} \tau \hat{\eta} \nu \tau \hat{\eta} s$   $\alpha lod \hat{\eta} \sigma \epsilon \omega s$   $\phi \alpha \nu \tau \alpha \sigma l \alpha \nu$ . The question whether in physical fact the voice can be said to move,  $\kappa u \nu \epsilon \hat{\alpha} \theta a u$ , across the range of unsung pitches within the interval, and then to come to a standstill,  $lo\tau \alpha \alpha \theta a u$ , at a given  $\tau \hat{\alpha} \sigma u s$  (pitch), is nothing to do with the present enquiry:  $\epsilon \tau \hat{\epsilon} \rho \alpha s$   $\epsilon \sigma \tau u s \alpha u u s \alpha u u s \alpha u$ 

<sup>7</sup> The association of pitches with 'speeds', as contrasted with lengths (primarily of strings) seems to originate with Archytas, who appears to have linked them with the speed of a sound's propagation (DK 47, B1, A19a). This theory is adopted at least sometimes both by Plato (*Tim.* 80a-b) and Aristotle (e.g. de Gen. An. 786b7 ff.): it seems also to be one of the theories criticised by Theophrastus in his attack on the number-theorists (see Porphyry's Com-

mentary on Ptolemy's Harmonics [ed. Düring] 61.22-65.15, especially 63.19 ff.). Their connection with speeds of vibration is apparently due to Heracleides (reported in Porphyry op. cit. 29.27-31.21). On the whole subject, the most useful discussion still seems to be that in K. von Jan, Musici scriptores Graeci (Leipzig 1895) i 134-41.

Aristoxenus is plainly not arguing here that physical theories of sound-production in general, or any particular theories, are false. He is claiming only that they have nothing to do with the study of music. However it may be caused, the musical just is what is perceived in one way, the non-musical what is perceived in another.

The accusation of 'extraneous reasoning' seems in part to refer to the attempt to define musical relations in terms of mathematical ones—whether between entirely abstract quantities, between lengths of vibrating strings, between rates of vibration, or whatever. This the Pythagoreans, followed by Plato and in part by Aristotle, had notoriously tried to do, and it is, according to Aristoxenus, entirely misguided. To define, for example, the octave as the ratio 2:1 is the merest nonsense: the octave is just what we hear as a certain concord, and it is that independently of any mathematical analyses which may be applied to the conditions of its production.

The quarrel is to a great extent about the aim of musical analysis—in what terms something obscure is to be explained in order for it to count as 'explained'. As Macran noted in his edition,8 the point is well made by a contrast between the Aristoxenean and the Pythagorean definitions of a tone. A tone (τόνος) is not something immediately 'given': it does not come to the notice of our senses already neatly labelled with its name. It needs so specifying as to be readily identified in terms of things which are given or understood; and whereas the Pythagoreans9 define it as the difference between two sounds whose vibration-rates (or otherwise specified τάχη πρὸς ἄλληλα: see n. 7) stand in the ratio 9:8, Aristoxenus (21) defines it as the difference between the intervals of a fourth and a fifth. In fact Macran's remarks need supplementing, since the Pythagoreans also use what is verbally the same formula as Aristoxenus's. 10 But for them the expressions 'fourth' and 'fifth' refer to the intervals between two notes whose  $\tau \dot{\alpha} \chi \eta$  stand in the ratios 4:3 and 3:2 respectively, and the size of the tone follows as an inference, 11 whereas for Aristoxenus the fourth and the fifth are simply certain heard concords, and nothing can be inferred from the formula about the mathematical value of the tone. Why this account seems adequate and appropriate to Aristoxenus will emerge more fully later, but crudely it is because the fourth and the fifth are intervals which the ear can accurately identify, and it is possible, as we shall see, to construct a tone through operations involving accurately perceivable concords alone.

Aristoxenus's other charge against these theorists is that what they say is contrary to the  $\phi \alpha \nu \delta \mu \epsilon \nu \alpha$ , and it is a good deal less obvious what he means by that. It is perfectly true that there are  $\phi \alpha \nu \delta \mu \epsilon \nu \alpha$ , facts of experience ascertainable by ear, which the Pythagorean system cannot readily accommodate. As Lippman says, 'Tones can be divided into halves, the fourth consists of  $2\frac{1}{2}$  tones, the cycle of twelve fifths returns to the original pitch: all impossible notions from the Pythagorean point of view, but easy to demonstrate in Aristoxenean harmonics.' Unfortunately, though Aristoxenus does discuss two of these  $\phi \alpha \nu \delta \mu \epsilon \nu \alpha$ , he nowhere argues, as admittedly he might have done, that number-ratio theories cannot accommodate them. What he does say on the subject is actually quite different, and very interesting indeed.

In sections 46–50 he sets out to explain the differences between the  $\gamma \acute{\epsilon} \nu \eta$ ; and this leads him into a sustained attack on certain mathematical conceptions of the nature of, and the relations between notes. In different  $\gamma \acute{\epsilon} \nu \eta$ , as I have explained, the notes intermediate between the fixed points  $\mu \acute{\epsilon} \sigma \eta$  and  $\dot{\nu} \pi \acute{\alpha} \tau \eta$  vary in position. Aristoxenus here argues that the  $\lambda \iota \chi a \nu \acute{\epsilon} s$  can move over the range of a tone, and the  $\pi a \rho \nu \pi \acute{\alpha} \tau \eta$  over that of the smallest diesis, i.e. a quarter-tone (46–47). And, he goes on (47), some people are astonished ( $\theta a \nu \mu \acute{\alpha} \zeta o \nu \sigma \iota$ ) that we continue to call this note the  $\lambda \iota \chi a \nu \acute{\epsilon} s$  when its intervallic relation to the fixed notes changes. That of  $\mu \acute{\epsilon} \sigma \eta$  to  $\dot{\nu} \pi \acute{\alpha} \tau \eta$  is invariant: this relation is what makes them  $\dot{\nu} \pi \acute{\alpha} \tau \eta$  and  $\mu \acute{\epsilon} \sigma \eta$ . Hence we must surely allow that notes standing at different intervals from the  $\mu \acute{\epsilon} \sigma \eta$  are different notes ( $\phi \theta \acute{\epsilon} \gamma \gamma \iota \iota$ ), and not the same one. In general, notes bounding unequal intervals should be different notes, and notes bounding equal intervals should be the same notes. The background assumption of this position is plainly that—once we have taken some note or other as our starting point—other notes are to be defined in relation to it strictly by reference to the interval which they form with it. Aristoxenus is

<sup>8</sup> Macran 245.

<sup>9</sup> E.g. DK 47 A16, A17.

<sup>10</sup> E.g. Euclid, Sect. Can. 13.

<sup>11</sup> Loc cit

<sup>&</sup>lt;sup>12</sup> E. A. Lippman, Musical Thought in Ancient Greece (New York and London 1964) 150.

arguing against any such criterion for the identity of a note, whether the thing is done by Pythagorean ratios or not.<sup>13</sup>

He has a variety of answers. To begin with, the adoption of the rule 'same interval, same bounding notes' would be a remarkable innovation ( $\mu \acute{e}\gamma a \tau \iota \kappa \iota \nu \acute{e}\iota \nu \acute{e}\sigma \tau \iota \nu$ ), since there are many pairs of notes distinguished in the ordinary nomenclature whose members stand at the same distances apart. They differ, not in their intervallic relation to all other notes, but by what he calls their  $\delta \acute{\nu}\nu a\mu \iota s$ , their function, a conception to which I shall return shortly.

The converse requirement, that each distinct interval from a given note must designate a distinct  $\theta\theta\delta\gamma\gamma\sigma$ , would demand an infinite number of  $\theta\delta\gamma\gamma\sigma$  and an infinite vocabulary (48). For mathematically there is no limit to the number of locations within its total range which the note we call  $\lambda\iota\chi\alpha\nu\delta$ s might occupy, and on this theory each locus will mark a different note. And musically there is no reason to restrict the number of possible loci within that range, let alone to restrict it to one locus: there is no musical requirement on us to prefer one 'shade' of a  $\gamma\epsilon\nu\sigma$  to another—i.e., to insist on this as opposed to that minor variation of tuning. If, perhaps, such special loci might be picked out by specifically mathematical criteria—that this interval and not that can be expressed as a ratio between integers, for instance—there is no reason at all why such considerations should place any constraints on music.

Here we come to the central point. Given a particular position of the  $\lambda\iota\chi\alpha\nu\delta$ s, the ear will hear a scale of the appropriate  $\gamma\epsilon\nu$ os. Given a position only marginally higher or lower, the ear may indeed detect a difference, but it will still recognise the same scale, differently coloured or 'shaded'. If we insist on mathematical equalities and inequalities as our sole criterion we shall, Aristoxenus says (48), be abandoning  $\tau\eta\nu$   $\tau\sigma\hat{\nu}$   $\delta\mu\sigma$ olov  $\tau\epsilon$   $\kappa\alpha\hat{\iota}$   $d\nu\sigma\mu$ olov  $\delta\iota d\gamma\nu\omega\sigma\iota\nu$ . Perceived similarities simply do not correspond to mathematical ones, and it is the perceived similarities which constitute properly musical groupings or categories. For instance, there is the term  $\pi\nu\kappa\nu\delta\nu$ , literally 'compressed', which is used to refer to pairs of small intervals: their common feature is that when heard together they make a compressed, crunchy sort of sound ( $\pi\nu\kappa\nu\sigma\hat{\nu}$   $\tau\nu\nu\sigma$   $\phi\omega\nu\hat{\eta}$ ). If we are compelled to limit the use of the term  $\pi\nu\kappa\nu\delta\nu$  to a single mathematical relation, we shall have no means of referring to what is actually there, as heard, a feature common to a whole collection of intervals lying within a range whose limits can be determined by  $\alpha\iota\sigma\theta\eta\sigma\iota\sigma$  alone.  $\epsilon\iota\nu\phi\sigma\iota\nu\sigma$   $\epsilon\iota\nu\sigma$   $\epsilon\iota\nu\sigma$ 

This explains, I think, the principal sense in which treating musical relationships as being fundamentally mathematical ones leads to conclusions contrary to the  $\phi \alpha \iota \nu \delta \mu \epsilon \nu \alpha$ . We shall see that Aristoxenus is not by any means claiming that mathematics has no part to play in musical analysis: what he is insisting is that the mathematical tools must be applied to things recognisable as heard, and further, as I shall try to explain below, that the mathematical relations employed must themselves be specifiable as, or reducible to, relations identifiable by  $\alpha \iota \delta \theta \gamma \sigma \iota s$ .

Before I turn to these points, I should add a word or two more about the principles governing the identity of notes. There are two senses in which Aristoxenus is insisting that a note remains the same note irrespective of mathematically specifiable shifts. First, a note remains e.g. the  $\lambda\iota\chi\alpha\nu\delta s$  of an enharmonic scale, despite minor variations of pitch, just so long as the ear recognises the scale as enharmonic, and the note as that next below the  $\mu\epsilon\sigma\eta$  (49). Secondly, a note remains  $\lambda\iota\chi\alpha\nu\delta s$  over a much wider range of variation, right through the  $\gamma\epsilon\nu\eta$ , just so long as the ear recognises it as being that note which by nature,  $\phi\iota\sigma\epsilon\iota$ , stands in that position on the scale. It is said to be the same note by having the same function,  $\delta\iota\nu\alpha\mu\iota s$  (49).

Concerning this notion of function we evidently need to enquire by what means we apprehend something as 'having the same  $\delta \dot{\nu} \alpha \mu \iota s$ '. A certain amount is plain enough: in particular, that while hearing a note as being of a given pitch requires only that we hear that note, hearing it as performing a given function requires its relation to a musical context and its location

on the three γένη (DK 47 A17). But Aristoxenus wishes to emphasise his concept of δύναμις, in particular its nonmathematical basis: and he would not be the first or the last polemicist to enhance his argument by erecting straw opponents for speedy demolition.

<sup>13</sup> None of the theorists whose work we know seems to have adopted a view quite as crude as that which Aristoxenus here criticises. The Pythagoreans, despite their devotion to mathematics, were well aware of the distinctions he is making, as is shown by Archytas's work

within a structure. Quite a close parallel can be made with modern expressions such as 'leading note'. If someone sings up the first seven notes of a major scale we can 'hear' that the note he has arrived at is the leading note of that scale: if without context he merely sings a note, we can hear only its pitch, and cannot assign it any function.

So far Aristoxenus's conceptions seem to parallel ours quite satisfactorily. Beyond this, unfortunately, it is a matter which he leaves disappointingly vague. But certain of his observations may be helpful. At 33, in a more or less methodological passage, he tells us that the whole of our musical analysis must be based on the judgments of  $\tilde{a}\kappa o \hat{\eta}$  and  $\delta \iota a \nu o i a$ , and whereas it is the task of ἀκοή to judge the size of intervals, it is by διανοία that we  $\theta \epsilon \omega \rho o \hat{u} \mu \epsilon \nu \tau \dot{\alpha} s$  τούτων δυνάμεις. It is a pity that although editors and commentators have made much of this remark, 14 he does not himself follow it up. He is swept instead into a further discussion of the central role of sense-perception, implicitly continuing his contrast of correct procedure with that of the Pythagoreans, whose claims, like those of the geometers, are independent of the evidence and accurate training of  $allow{\eta}\sigma us$ , and hence do not count as referring to music at all. In a later passage (38-9) he again refers to ἀκοή and διανοία as judges of musical distinctions; but here he passes at once to the claim that understanding of music is compounded of αἴσθησις and μνήμη. Speculatively, we might reconstruct his position as being that perception identifies intervals, and memory stores their sequence, thus creating the material for the sort of 'context' mentioned above; while the role of διανοία is to identify the sequences not merely as sequences of intervals, which would be musically meaningless, but as forming or implying structures within which the notes stand in functional relationships to each other. Beyond this we cannot say how the analysis might have continued. It is plain only that  $\dot{\eta}$   $\tau o\hat{v}$   $\mu \dot{\epsilon} \lambda ovs$   $\phi \dot{v} \sigma \iota s$  is not to be specified in terms of intervallic relations alone, but also and primarily by reference to musical δυνάμεις, functions. (See also his passage on notation, 39-40.)

We can gather rather more about the status of the  $\gamma \acute{e}\nu \eta$  and their relation to  $a \idelta \partial \eta \sigma \iota s$ . Ultimately the distinctions between them are to be made in terms of differences in perceived character. We can see this, for instance, in Aristoxenus's complaints about those modern musicians who invariably restrict their  $\lambda\iota\chi\alpha\nuo\iota$  to the higher positions—in or near the diatonic  $\gamma\acute{e}\nu os$ :  $\tauo\acute{\nu}\tauo\upsilon$   $\delta$ '  $a \idelta \iota \tau$   $\delta$   $\beta o \acute{\nu}\lambda\dot{\epsilon}\sigma\theta a\iota$   $\gamma\lambda\upsilon\kappa a \idelta \iota \tau$ , he says; and if they try to play enharmonic they inevitably shift towards the chromatic,  $\sigma \upsilon\nu\epsilon \pi\iota\sigma\pi\omega\mu\acute{\epsilon}\nu o\upsilon$   $\tauo\hat{\upsilon}$   $\mu\acute{\epsilon}\lambda o\upsilon s$ , destroying the character of the melody (23).

But the distinctions between  $\gamma \hat{\epsilon} \nu \eta$  are subtle and not obvious. We need to use not just the ear, but the trained ear, to discover their various  $\phi \hat{\nu} \sigma \epsilon \iota s$ . Aristoxenus reverts many times to this theme (e.g. 22-3, 32-3, 34-5, 40-1), and invariably treats the  $\gamma \hat{\epsilon} \nu \eta$  not as invented, but as discovered, and as present already in the nature of music for the student to grasp. In one passage he lists them in the order in which  $\hat{\eta}$   $\tau o \hat{\nu}$   $\hat{\nu} \nu \theta \rho \hat{\nu} \nu \sigma \nu \phi \nu \sigma \nu s$  comes across them, and remarks that it is only  $\mu \delta \lambda \iota s$   $\mu \epsilon \tau \hat{\nu} \nu \delta \nu \sigma \nu s$  to the enharmonic (19,  $\epsilon f$ . also 47-50 and 52).

Given this conception, it becomes far from obvious why he believes that there can be no other  $\gamma \acute{e}\nu \eta$  (44). His procedure is, in the main, to ask what features can be found to link (a) all musical sequences recognisable as melodious, and (b) all such sequences recognisable as having a certain fundamental character. He finds, among many other things, the common  $\delta \nu \nu \acute{a}\mu \epsilon \iota s$  in answer to the first question, and the directly perceived but analysable character of the  $\gamma \acute{e}\nu \eta$  in answer to the second. But it is plain, even explicit in one passage (35), that he is considering only existing melody: his subject matter is what we do recognise as musical: and because his method is at least in intention rigorously empirical, and because the principles ( $\mathring{a}\rho\chi a \imath$ ) which he derives are constructed precisely to cover those cases which are recognised as musical and to rule out all others, it is perhaps not surprising that the possibility of extrapolating to admit wholly new kinds of musical sequence escapes him.

Seductive though this kind of criticism is, it is also pretty woolly, and makes no serious dents in Aristoxenus's procedure or his results. There is, however, a much more crucial and much more precise theoretical difficulty in his acceptance and analysis of the existing  $\gamma \acute{e}\nu \eta$ . I should like to approach it rather gradually, setting out one or two other central theses on the way.

<sup>&</sup>lt;sup>14</sup> Cf. e.g. Lippman 149-50.

In a number of cantankerous and rather difficult passages (2, 7–8, 27–8, 38, 53), Aristoxenus has harsh words to say about his opponents the  $\dot{\alpha}\rho\mu\nu\nu\kappa\omega\dot{\alpha}$  for their adoption of a procedure which he calls  $\kappa\alpha\tau\alpha\pi\dot{\nu}\kappa\nu\omega\sigma\iota s$ , compression. It arises in connection with the attempt to express in diagrammatic form the relations between the various modes in a single structure. A mode, for these purposes, is an ordered sequence of intervals: any mode, Dorian, Phrygian, or whatever, contains the same intervals but in its own peculiar sequence, and each may appear in all the three generic forms, enharmonic, chromatic, diatonic. If we take the enharmonic versions, which involve quarter-tones, it is possible so to choose the pitch-relations between the various modes that the range of the notes used in the expression of them is as small as it can be, a sequence of 28 consecutive quarter-tones, or enharmonic 'dieses'. Onto this sequence all the modes in their enharmonic form can be mapped, the  $\mu\epsilon\sigma\eta$  of each standing at a distance of 3 dieses from its predecessor. This is what Aristoxenus means by  $\kappa\alpha\tau\alpha\pi\nu\nu\omega\sigma\iota s$ .

We can gather from what he says in the sections I have mentioned that the purpose of representing the various modes in set intervallic relations to one another is to explain the possibilities of modulation between them ( $\mu\epsilon\tau\alpha\beta\delta\lambda\dot{\eta}$  συστηματική). Now the general principle of intermodulation in the later Greek theorists is such that it is possible only if the mode from which you start and that to which you move have in common not only particular pitches, but pitches which are, as Bacchius puts it, ὅμοιοι κατὰ τὴν τοῦ πυκνοῦ μετοχήν: 15 that is, in effect, standing in the same functional role in a tetrachord. As represented in the καταπύκνωσις diagram, none of the modes stands in this relation to any other, since, for arithmetical reasons which I shall pass over, 16 such relations are possible only between modes whose μέσαι are a tone, a fourth, a fifth or five tones apart, and no pairs of modes as represented in the diagram fulfil any of these conditions. καταπύκνωσις is therefore useless as an attempt to explain intermodulation.

It is characteristic of Aristoxenus that although his comments could be extended to generate this result, he uses a more limited argument, and one designed to express something of the basis of these rules in sense perception. The ἀρμονικοί, he says (53), apparently discount (ὀλιγωρεῖν) the proper ordering of melody, as is made clear ἐκ τοῦ πλήθους τῶν ἐξῆς τιθεμένων διέσεων. For the voice cannot connect even as many as three dieses. This claim is elaborated in the alternate passage, 28. The voice, he says here, τὴν τρίτην δίεσιν πάντα ποιοῦσα οὖχ οῖα τέ ἐστι προστίθεναι, but if ascending after two dieses ἐλάχιστον μελωδεῖ τὸ λοιπὸν τοῦ διὰ τεσσάρων (the remainder of a fourth), and if descending τονιαίου ἔλαττον οὖ δύναται μελωδεῖν. Any smaller movements are impossible. Hence, the moral is, one cannot reach the μέση of the next key, as here represented, since it stands in a musically impossible relation to elements in the existing mode.

Now taken at face value this is both false and pointless. It is admittedly difficult to sing three quarter-tones in a row with any accuracy, but it is not impossible: even if it were, the thing can readily be done on a stringed instrument: and even if that were not so, the next possible upwards interval is certainly much less than the remainder of a fourth, which is two whole tones. Further, Aristoxenus himself has a long and bad-tempered passage explicitly aimed at refuting those who would base claims about music on the features and limitations of instruments (41–3). And again, merely to show that one cannot sing the continuous succession of intervals from one  $\mu \epsilon \sigma \eta$  to the next plainly fails to show that one cannot get there in practice by any means: one can after all readily skip a note and get there by the progression of a quarter-tone and a semitone.

Aristoxenus is not, I think, quite so stupid. His point is rather that to move to a position three dieses away from a pitch on our original scale, and already preceded in the structure of that scale by two shifts of a diesis each, is to move to a position which musically speaking does not exist. It is of the nature of melody ( $\dot{\eta}$   $\tau \hat{\eta} s$   $\mu \epsilon \lambda \omega \delta i as$   $\phi \dot{\nu} \sigma i s$ , much in evidence in this passage) for the notes of a scale to be defined by their  $\delta \dot{\nu} \nu a \mu i s$  or musical function: when we move up by quarter-tones in the enharmonic scale from  $\dot{\nu} \pi \dot{\alpha} \tau \eta$  to  $\pi a \rho \nu \pi \dot{\alpha} \tau \eta$  to  $\lambda i \chi a \nu \dot{\alpha} s$ , there remains no functional location—hence no note—short of  $\mu \dot{\epsilon} \sigma \eta$ , which invariably stands at a distance of a fourth from  $\dot{\nu} \pi \dot{\alpha} \tau \eta$ . These functions exist as natural and essential constituents of properly constructed melody, and the criterion of this, of the identity of this or that note as having a given  $\delta \dot{\nu} \nu a \mu i s$ , rests with  $\alpha i \sigma \theta \eta \sigma i s$  coupled with  $\mu \nu \dot{\eta} \mu \eta$  and  $\delta i a \nu o i a$ . We might say that a sequence of notes which actually progressed, mathematically speaking, into this 'impossible' position would be heard either as not

<sup>15</sup> Isagoge 20.33 ff. (Meibom) quoted by Macran 262.

melodic at all ( $\tilde{\epsilon}\kappa\mu\epsilon\lambda\epsilon$ s) or, perhaps, as involving a poor attempt to repeat the  $\lambda\iota\chi\alpha\nu\delta$ s or to reach the  $\mu\epsilon\sigma\eta$ .

We may well ask how Aristoxenus can be so sure of all this. It is not simply that he is committed to recognising the existing  $\gamma \acute{\epsilon} \nu \eta$  as representing the only possible forms of musical sequence, and the accepted  $\delta \nu \nu \acute{a}\mu \epsilon \iota s$  as unique—these 'truths' come to him from aesthetic experience, and cannot, perhaps, be judged further. But his arguments also depend on the attribution to the given  $\gamma \acute{\epsilon} \nu \eta$  of a mathematically expressed intervallic structure, and on the possibility of pinning down quantitatively—even if, admittedly, over a  $\tau \acute{\epsilon} n \sigma s$ —the intervals between notes of given  $\delta \nu \nu \acute{a}\mu \epsilon \iota s$ . This obviously is not given in the direct perception of an interval, taken by itself. We need a  $\mu \acute{\epsilon} \tau \rho o \nu$ , a standard of measurement, to which we can refer the heard intervals, and on Aristoxenean principles it must be one specifiable in relation to some identifiable object of  $\alpha \i \delta \nu \delta \eta \sigma \iota s$ , not merely e.g. a mathematical ratio.

Given some pitch as starting point, a particular quality of discord constructed on it will be producible not just by a note at some unique locus, but by one at any locus over a range  $(\tau \delta \pi o s)$ . Within that range there is no distinction of heard quality in the discord; hence, from a musical point of view, it is the same discord, and it would be a mistake comparable to those discussed earlier even to try to pin it down 'accurately' to a particular size of interval. There is no such thing as this 'accuracy'. It follows that no discord will do to establish a heard point of reference to which we may relate the sizes of other intervals: and the diesis is of course a discord.

So Aristoxenus turns to concords, which, so he claims, are definitely determined to a particular magnitude— $\delta \lambda \omega s$   $o \delta \kappa$   $\epsilon \chi \epsilon \iota \nu \tau \delta \pi o \nu \delta \lambda \lambda$   $\epsilon \nu \iota \mu \epsilon \gamma \epsilon \theta \epsilon \iota \omega \rho \iota \sigma \theta \alpha \iota$ . We can identify the fourth, the fifth and the octave definitely and precisely by ear. Effectively, though for most purposes Aristoxenus's explicit  $\mu \epsilon \tau \rho o \nu$  is the tone, a discord, the reference point for all measurement of intervals is a concord, or rather the first two concords taken as a pair. As we saw earlier, the tone is defined, stipulatively but on the basis of existing tradition, as the difference between a fourth and a fifth.

Given that, it is possible to ascertain the sizes of other intervals relatively to the tone by an ingenious method of construction involving concords only, and thus capable of being checked against the evidence of  $ai\sigma\theta\eta\sigma is$  (55–7). Thus, in practical musicianship, if for example we want to find a note two tones below a given note, we do so by finding the fourth above, the fifth below that, the fourth above that again, and finally the fifth below that (55). More importantly for the purposes of musical theory, we can demonstrate by the same method that, for instance, the fourth itself is an interval of  $2\frac{1}{2}$  tones, and can use this (actually highly controversial) putative fact in subsequent arithmetical analysis. <sup>17</sup> (The first example will play its part in theory too, since it is required for the demonstration of the size of the fourth; see sections 56–7.)

Aristoxenus obviously considers all this crucially important, and fundamental to the arithmetical conclusions which he draws. There is no way conformable to his views about the primacy of alognous, other than by this 'principle of concordance', that we can accurately establish the size of an interval in relation to the tone: and given this principle it is possible to use abstract arithmetical reasoning concerning the relations between the intervals so specified.

But it does not seem to be enough for his purposes. The point I wish to make is this. The principle of concordance, useful though it is, will not allow us to construct intervals smaller than the semitone. (Semitones are constructed quite legitimately in the demonstration of the size of the fourth.) Of course we can if we wish for the purposes of theoretical analysis *talk* about intervals

smaller than that: Aristoxenus in his calculations mentions intervals as small as one twelfth of a tone, far smaller even than the least  $\mu\epsilon\lambda\omega\delta\delta\delta\nu\mu\epsilon\nu\nu\nu$ . But what we cannot do is to establish by reference to perception that this or that heard interval is one third or one quarter of a tone. Thus, it appears, it is no good Aristoxenus asserting that the quarter-tone is the least  $\mu\epsilon\lambda\omega\delta\delta\nu\mu\epsilon\nu\nu\nu$ , and is the interval between this and that note of the enharmonic scale: for what counts as the least  $\mu\epsilon\lambda\omega\delta\delta\nu\mu\epsilon\nu\nu\nu$  and what counts as being the enharmonic scale are, on his own principles, determined directly by  $\alpha i\sigma\theta\eta\sigma\iota s$ , by ear, not by any abstract mathematical considerations. There simply is no way of showing that this interval, heard as the space between enharmonic  $\nu\pi\alpha\tau$  and  $\nu\pi\alpha\rho\nu\pi\alpha\tau\eta$ , stands in just that mathematical relation to the tone. Of course, Aristoxenus may in part be recognising this when he grants range,  $\nu\alpha\sigma s$ , not absolute location, to certain of the notes bounding these intervals: but his desire for systematisation outstrips his equipment even so, since he insists on giving arithmetical values to the extent of these  $\nu\alpha\sigma s$ , values which still require us to recognise the precise interval of a quarter-tone. And if he is not allowed this degree of precision, a great deal of the detailed derivation of theorems in Book III must be without foundation.

Aristoxenus was an innovator, consciously and often bumptiously so. His objective was to claw back the study of music from the hands of physicists, mathematicians, and mere recorders of low-level empirical fact, and to establish it as an independent science having its own laws and principles, and a subject matter with its own distinctive  $\phi \dot{\psi} \sigma \iota s$ . Problems arising from the facts of musical experience—why this is a possible melody while that is not, why some modulations are possible and not others, in what relations the heard intervals stand to one another, in what the identity of notes in a scale consists, and so on-all these are to be explained not in terms of the physics of sound production or by abstract mathematical considerations, but through principles inherent in our experience of sound as musical, and depending ultimately on αἴσθησις, on what we perceive as melodious, concordant, and the like. His contribution to the study of music is significant, and goes far beyond anything I have said in this paper: and so, I think, is his contribution to our understanding of the notion of an independent science in the Aristotelian mould. But I have argued that in crucial respects he mistook the proper direction of his science, and overstepped the limits which his methodological principles laid down. Perhaps the influence of his reputedly Pythagorean upbringing, though he explicitly rejected all that it stood for, made the Siren-song of Number in the end too seductive.

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Music in the Philosophy of Boethius

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## MUSIC IN THE PHILOSOPHY OF BOETHIUS<sup>1</sup>

By LEO SCHRADE

RESOLVE, in some measure, the ideas of Aristotle and ▲ Plato into harmony"—in his commentary on Aristotle's De Interpretatione, Boethius thus designated the object of his own philosophy. Endowed with a prodigious precocity, and guided by the wisdom and experience of Symmachus, his father-in-law and one of the most cultivated Roman patricians of his time, Boethius set about this immense task when he was little more than twenty years old. Appropriately he began with comments on Porphyry's Introduction, which scholars of the 5th century took to constitute an integral part of Aristotle's logical works grouped together under the title Organon. He proceeded in logical order from the work on the Categories to the four books De topicis differentiis. Between 510, the year of his Consulate, and 526, the year of his savage execution, he also wrote the Opuscula Sacra, the authenticity of which seems as yet not completely established. At the end there is the Consolatio Philosophiae. At the beginning of all his humanistic studies and entire literary work there is the Quadrivium, which consists of the Institutio Arithmetica, the five, incomplete, books on Music, the Geometry, whose extant version may not, however, be genuine, and a lost treatise on Astronomy, possibly in eight books, if we put faith in a remark made by Gerbert in a letter he wrote from Mantua in 983. The work chosen for discussion, the treatises on the mathematical disciplines, originated between 500 and 506. They are Boethius' "first fruits". That the Quadrivium preceded all his other philosophical studies has an extraordinary significance and far-reaching implications.<sup>2</sup>

Boethius, the most influential teacher of the medieval musi-

<sup>&</sup>lt;sup>1</sup> This paper was read before the Greater New York Chapter of the American Musicological Society on May 22, 1946.

<sup>&</sup>lt;sup>2</sup> For previous discussions of the subject see the author's Das propädeutische Ethos in der Musikanschauung des Boethius, in Zeitschrift für Geschichte der Erziehung und des Unterrichts, XX (1930), 179-215; and Die Stellung der Musik in der Philosophie des Boethius, in Archiv für Geschichte der Philosophie, XLI (1932) 368-400.

cian, had a spiritual survival comparable to none. More than anyone else did he form the musical mind of medieval men. Most of them understood his treatise on music to be clearly a product of the Aristotelian doctrine; hence, they placed it into Aristotle's system of learning. But was the medieval musician thus a faithful interpreter of Boethius' thought? Did Boethius indeed speak as a representative of the Aristotelian philosophy when he wrote his Quadrivium? Or did his work on music share in the process of reconciling the philosophical thought of one school with that of the other? Or did the Institutio Musica perhaps precede this task of reconciliation which Boethius labored to materialize? First, then, it must be ascertained which of the philosophical schools held sway over his work on music. And the Institutio Musica must, furthermore, be classified as a type among learned treatises. For there again a question of far-reaching importance arises: is the treatise an "introduction" or an "exhortation to study"? The answers to these questions, if final answers can be given, should contribute in some way to an understanding of what should be regarded as the most essential factor in Boethius' world of music. How can we expect to comprehend the interpretation of Boethius in the Middle Ages, if we are not even clear about the nature of the very source?

In the preface to the *Institutio Arithmetica* Boethius declared that for the sake of reaching the "summit of perfection" granted by the philosophical discipline alone, it is necessary that man master preliminary fields of knowledge—that is, the mathematical disciplines, the *Quadrivium*, a term that Boethius himself seems to have introduced into the Latin world, probably in direct derivation from Nicomachus of Gerasa, who had spoken of "the four ways". The need to study the *Quadrivium*, to investigate the *Vis numerorum* in all its aspects, is indisputable. Boethius was convinced that whoever neglected such studies was totally and hopelessly ignorant of philosophy as a whole. Such neglect is without remedy: it forever withholds the reward from the student who aspires to the summit of perfection; unless he passes through the study of music within the scope of mathematics, he will be barred from the realm of philos-

<sup>&</sup>lt;sup>3</sup> The term Quadrivium (Inst. Arith., ed. G. Friedlein, Leipzig, 1867, pp. 7, 8) does not occur again, as far as I know, in Boethius' works. See however the term quadrifarius, in the letter of King Theodoric the Great to Boethius, in Cassiodori Variarum lib. I, 45 (Mon. Germ. Hist., Auct. Antiquiss., ed. Th. Mommsen, XII [1894], 40). For the term "the four ways" cf. Nicomachus Geras. Pythag. Introd. Arith., ed. R. Hoche, Leipzig, 1866, I. C. 3, p. 7f.

ophy. In other words: to acquire a knowledge of mathematics is a necessity of the first order. The goal of study, the end of education, is always philosophy; but the only path to it leads through mathematics.

The necessity of such studies, established emphatically and in various sections of Boethius' mathematical books, suggests an important consideration. If knowledge of music must be obtained under all circumstances, is it because the discipline must be regarded as an *instrument* or a *part* of philosophy? This is precisely the same question that ancient thinkers raised when discussing the character and place of logic. And in exactly the same temper of mind they disputed the position of logic and mathematics in relation to philosophy. This problem, in fact, holds the key to the affiliation of Boethius to either Plato or Aristotle at the time when he wrote his books on music.

One of the most important among the few passages in which Plato discussed the course of philosophical study asserts the primarily didactic character of mathematics. It is the well-known and often-quoted paragraph from the seventh book of the Republic. From there Boethius derived the main characteristics of his Quadrivium; from there he took Plato's idea that there is inherent in mathematics a knowledge that draws the human soul from becoming to being.4 Indeed, Boethius' "summit of perfection", where philosophy resides and where man becomes able to contemplate the Being, exercises this very attraction which diverts man's mind from the confusing and deceptive world of change to the ever true and unalterable world of ideas. The conviction that mathematics is instrumental in this process has its origin in Platonic philosophy. Even in matters of external evidence, Plato stands above Aristotle in the whole of Boethius' Quadrivium: Plato alone is there called "the most learned", while Aristotle appears as "the greatest savant in all things" for the first time in Boethius' second commentary on Porphyry's Introduction; and not until he came to work on Aristotle's De Interpretatione did Boethius reckon himself and those who thought along the same lines to be "savants of the Aristotelian authority". No such expression ever occurs in any of his mathematical treatises. There Plato fathered the leading ideas and their formulation. The preface to the Arithmetic is governed by Platonic terms and thoughts. Boethius refers to the rise "towards the greater

<sup>4</sup> Republic, VII, 521.

certainties of intelligence"; he speaks of the existence of a "purer reason of the mind"; he presents the process of training the human mind as a "progression" that culminates in the infallible deliberation of the philosophic intellect. The man who takes part in this progression responds to an ethical drive that lies in the nature of mathematics. And since the ethical impulse reaches its aim only when the human mind comes to rest in philosophy, mathematics is an instrument, rather than a part, of philosophy. All this goes clearly back to Plato. But Platonism made its way to Boethius often indirectly through the Pythagorean school, by means of sources that allow further substantiation of the attitude Boethius had taken in his Musica. They all show that mathematics, and music within it, is not the true "science", philosophy itself, but preliminary or preparatory, and beneficial only as long as it keeps the ethical impulse aiming at the freedom of man's mind from forms of empirical deception.

In order to substantiate the doctrine of ethical purpose and pre-philosophic character in Boethius' mathematics, we should do well to seek assistance in the sources used by Boethius. That the Institutio Arithmetica comes from the work of Nichomachus has been stated by Boethius himself. Other sources, however, influenced Boethius to at least as great a degree as the work of Nichomachus. At all events, they allow us to see how the ideas of the Platonic and Pythagorean schools converge in the Quadrivium of Boethius to form the type which made its appearance in his mathematical treatise at the beginning of the 6th century. There is first the Precepts of Platonic Thought by Albinos, not Alkinoos, under whose name the treatise has been published.5 In accordance with the plan of this work to give an educational outline for the study of Platonic ideas, the pre-philosophic task of mathematics is clearly specified. The mathematical studies have no purpose of their own; they are instrumental in whetting man's appetite for investigating the true Being. Thus they have a function to fulfil. Together with this function, there comes the preparatory or educational effect the study of mathematics has upon the human mind; it increases the mind's capacity for thought, for thinking; it makes the mind keen or, to put it in Albinos' words, it sharpens the human soul to be

<sup>&</sup>lt;sup>5</sup> Platonis Dialogi, ed. C. F. Hermann, Leipzig, 1858, VI, 152 ff. See also J. Freudenthal, Hellenistische Studien 3., Der Platoniker Albinos und der falsche Alkinoos, Berlin, 1879, p. 275 ff; in the same work, on p. 322 ff, a new edition of Albinos' prologue.

ready for the recognition of the Being; hence mathematics grants accuracy of vision into the nature of the Being. This is the same "mathematical accuracy" that Plato had discussed in his *Laws*. To give man the acuteness of mind needed for such knowledge is the sole purpose mathematics must serve.

The purely functional, ancillary character of mathematics has perhaps best, at any rate most briefly, been expressed by Nichomachus, who named mathematics a bridge man must cross to reach the realm beyond. All mathematical-musical studies must train the mind; they must free it from physical observations or exclusive perception by the senses. All our material experiences are bound up with the physical world. But the activity of the intellect should not be misguided or impeded by matter. Mathematics first and foremost sets the mind free from matter. And it is exactly this freedom of the mind from the body granted by mathematics to the student of philosophy of which Dante was thinking when he praised Boethius in Paradise: "There—in Paradise—the holy soul—Boethius—rejoices in the vision of the good for he had shown the falsity of the world of appearance to all those who had ears to listen to his word." 6

The acuteness and accuracy of thinking, and the metaphorical bridge that must be crossed to rise to the heights, both indicate the nature and purpose of mathematics as seen by Nichomachus, Albinos, and Boethius, in common with Plato.

But the ethical value of mathematical-musical studies, for the sake of which Boethius wrote his treatises on the Quadrivium, has been characterized most comprehensively by Iamblichus, the Neo-Platonist, Pythagorean, and possible pupil of Porphyry. Iamblichus, too, wrote an introduction to the Arithmetic of Nichomachus; yet more important is his book De communi mathematica scientia. True to Platonism, Iamblichus speaks of "accuracy" as being the effect of mathematics; he also uses the "bridge" as a metaphor with which to qualify the function of mathematics; and he points to the summit to be reached by the student. Probably because of his affiliation to the Pythagorean school of thought, he strengthens the ethical side of the mathematical theory. To be sure, he takes up the Platonic idea of the force of mathematics that draws the human soul from becoming to being. Yet the ethical implications are carried much further. The "journey of man's soul" is imagined to be

<sup>6</sup> Divina Commedia, Paradiso X, 124-26.

a rise from the darkness of night to the brightness of the truth of being. The rise furthered by mathematics has a cathartic effect on man. Whoever goes through the "mathematical practice" will be rewarded by the acquisition of ethical qualities such as symmetry and harmony. Hence the results that come from the study of mathematics are entirely educational, and in order to do justice to this quality Iamblichus calls the discipline as a whole a "mathematical education", as though education and mathematics were inseparable terms. Inasmuch as Iamblichus sees the "Beautiful and the Good" as an end in the conduct of life, to be in harmony with the recognition of the Being, the process that leads up to it is carried forward by the energies of ethics.

In the doctrine of music that Boethius formulated in his youth two elements, both of ethical nature, converge, and in this conjunction the ethical value of music surpasses that of any other discipline in the Quadrivium. For music as the art of sound exerts in all events and by its very nature an influence upon the moral state of man, or, in the words of Boethius himself, music is capable of "improving or degrading the morals of men". In addition to this, however, music as part of mathematics shares in those educational ethics that are inherent in the disciplines of the Quadrivium. It contributes to the training of the intellect, which in the end must be totally free from all bodily impediments. This is the meaning of the education in which music assists in liberating the human mind. The music Boethius described at the beginning of his literary activity is of Platonic-Pythagorean origin. It has no direct contact with the Aristotelian system of philosophy. Music stands before philosophy; and the student of music is driven by the ethical impulse to learn how to benefit intellectually from the instrument that holds the key to the "purer reason of the mind" in philosophy. With the assumption of a pre-philosophic position of music, with the thesis of its ethical function in the process of education, and finally with the denial that music as a "science" could be part of philosophy proper, Boethius gives evidence that he wrote his works on the Quadrivium essentially as a Platonist. In it he had no intention-and no need-of reconciling the Aristotelian and Platonic schools of thought with each other. This very conception that within the totality of the Quadrivium music has its place outside philosophy, that, furthermore, music embodies the ethical incitement to advance to the true discipline of thought, was

undoubtedly the reason why Boethius chose the Quadrivium as the subject he must investigate first. Thus, not only the character of the work, but also the reason for its existence resulted directly from that school of thought which regarded the study of music as an indisputable prerequisite for philosophy. The idea that originally called forth the treatise on music had been realized.

It may be puzzling to find that an incomplete book on music, written by a man of only twenty, exercised the most extraordinary influence upon centuries to come. It is less puzzling when we take into account both the ethical function and the position music was given in relation to philosophy. And it seems to be very characteristic of this school of thought that many a later philosopher actually did what Boethius had done, that is to say, started any work in philosophy with a treatise on music as a primary necessity, without ever returning to music again. This procedure is by no means accidental; it bears all the marks of the situation in which Boethius' work on music originated. The significance of this fact has been completely overlooked. Let us think of Augustine, to name only one author of the Latin world of humanities. The first work Augustine wrote is his treatise on music which, however, he did not complete in his youth. Though in later years he returned to the subject of music-in his commentaries on the Psalms-he did so merely for reasons of a religious nature which had nothing to do with the Musica as a discipline of the Quadrivium. When investigating the work of philosophers through the centuries we are surprised how often we find music opening the course of philosophical studies. Even Descartes, in 1618, still begins with an Essay on Algebra and the Compendium of Music. The theorists of music proper, also, in antiquity, the Middle Ages, through the 16th century (e.g., Glareanus) often first presented an "introduction" to music. But the reason for this would require a special discussion.

Although in later years Boethius did not continue to explore the subject of music, he discussed the position of mathematics, wherein music was always implied, if not expressly included. And this position changed completely. Beginning with his commentary on Porphyry's *Introduction* and continuing for the rest of his life, Boethius maintained the Aristotelian point of view in regard to the position of mathematics. In the system of Aristotle, mathematics became part of philosophy and ceased to function merely as an

"instrument". The complete Aristotelian system, as is well known, divides philosophy into the practical and theoretical spheres, with ethics, economics, and politics on the one side, and physics, mathematics, and metaphysics on the other. This order eliminated, at least partly, the disputes concerning whether to regard mathematics as part of or as an instrument for philosophy. Mathematics is a part of an objective system in which the purely ethical or preparatory functions have no longer the exclusive importance given to the *Quadrivium* in Boethius' earlier work.

Theoretical philosophy is divided in accordance with the objects to be discussed in each of its parts, the objects being the world of physical phenomena, the world of numbers, the world of the immaterial, abstract, true forms. This objective classification is based on the connection of each part with matter, and the degrees of abstraction from matter establish the rank of the disciplines, one above the other. To put this in Boethius' terms: physics comprise the bodily forms with matter, mathematics the bodily forms without matter, metaphysics the bodiless, immaterial forms, the ideas. The remoter the relation to bodies, the higher the discipline of philosophy. Hence in rank mathematics comes second and takes an intermediate position within the system as a whole.

While translating the work of Aristotle into Latin, Boethius made this system his own. It goes without saying that the immediate link to Aristotle offered itself as a matter of course. Since, however, Boethius' work contains many a feature supplementary to the Aristotelian system proper, he shows himself also under the influence of the Aristotelian tradition as a whole. As he proceeded in the Organon of Aristotle, he seems simultaneously to have acquired knowledge of a large part of a literature known as commentaries of the Aristotelian school. By the 6th century this literature had grown to vast proportions. It appears, indeed, that Boethius had studied most of the important commentaries from the 3rd to the 5th centuries. Not long before Boethius started his own literary work, Ammonius had made Alexandria a center of Aristotelian philosophy, being himself the rector of the school and the teacher of many of the distinguished philosophers of the 6th century. He wrote commentaries on the various parts of Aristotle's Organon, as did Boethius thereafter. Boethius seems to have known the commentaries of the Alexandrian school. At all events, this vast literature of the Scholia especially contributed to the further

qualifying of the various branches of philosophy. One problem in particular occupied the minds of the philosophers, including Boethius: the question of the various degrees of intellectual activity in the disciplines of theoretical philosophy. Since these disciplines had been put into a logical order that classified the objects in the form of a scale rising from the material substance to the immaterial idea, Boethius attempted to secure a special type of mental activity for each of the three branches; for physics, mathematics, and metaphysics. These attempts concern our problem because they affect the character of music as a science. In the course of his studies Boethius discussed the problem several times and with various results. Inasmuch as physics and physiology have the world of nature, the naturalia, as their object of investigation, mental activity relating to them is predominantly guided by impressions received through the senses, and hence is not at all free from deceptions and errors. In one of the later works Boethius named ratio, reason, as the mental force active in physics; but there is no uniformity of terms in his works. Inasmuch as the world of numbers is only partly related to material substance, since numbers can be mentally abstracted from bodies, mathematics stands above physics, accordingly the mental activity prevailing in mathematics ranks higher. It is the intelligentia, which takes the impression conveyed by the senses merely as the starting point. Metaphysics, whose object is the true idea, form without matter, has also the highest mental degree: the intellectus, completely free from all relation to the senses. It must, of course, be the ambition of man to reach this highest phase of intellectual activity. Once more, then, we find a didactic rise in the training of man's mind together with the rise of the disciplines themselves.

We are here interested in mathematics alone. Boethius once stated that in mathematics man thinks disciplinaliter, "according to the discipline". This is a rather mysterious term, and one must search far and wide to discover its implication. In fact, the term is unique in the hellenistic and late Roman literature; according to the Thesaurus linguae Latinae Boethius used the term for the first time. Disciplinalis, doctrinalis, "pertaining to the discipline, to the doctrine", such are the terms related to the process of thinking in mathematics. Indeed, we must go to the Middle Ages to find out what they mean; the medieval commentaries on Boethius' work actually give the explanation. Commenting on Boethius, Gilbert de

la Porrée states simply that the science the Greeks called "mathematics" has been named "discipline" by the Latins.7 A similar explanation was given by Clarenbaldus of Arras, who speaks of mathematics as though it were the discipline.8 And so does Thierry of Chartres, who commented on the passage of Boethius at great length.9 When taking up this very matter St. Thomas Aquinas declared that Boethius termed mathematics a "discipline" because of the demonstrative method. This statement leads the argument back to Ammonius, from whom Boethius may be believed to have taken up the discussion. For Ammonius also understood that in mathematics the process of reasoning is "mathematical", and he pointed out that the method of the discipline is syllogism. This method, however, was regarded, because of its logical conclusiveness, as superior to any other process of thinking. Now it seems clear why mathematics could be called the disciplina disciplinarum, and why in the Middle Ages even music (as a part of mathematics) could sometimes be singled out as the discipline of all disciplines.

Once Boethius had started out to make the Organon of Aristotle accessible to the Latin West, he accepted, without any further doubt, music as a science within philosophy. Through the objective system of Aristotle music had obtained a logical position which did not change as long as the discipline was held to be part of philosophy. Together with this secure position, the method of argument, and the specific character of intellectual activity that gave mathematics a superior distinction, music came to have its definite share in ancient ontology. Thus it became an important element in the philosophical process of revealing the very essence of things.

It is in this form that Boethius handed down the doctrine of music as a science definitely placed in the Aristotelian system. This may seem strange, since his first work on the Quadrivium did not represent the system of Aristotle. It was, however, Boethius' treatise on music that the medieval musicians and thinkers studied. Many, of course, also knew the Consolatio, the most widely read book of the Middle Ages. But by no means all of them were familiar with his commentaries on the Aristotelian Organon. Most of them, none-

<sup>&</sup>lt;sup>7</sup> Gilberti Porretae Commentaria in Librum de Trinitate, in Patrologia Latina, Vol. 64, p. 1267 B/C.

<sup>8</sup> See W. Jansen, Der Kommentar des Clarenbaldus von Arras zu Boethius De Trinitate, in Breslauer Studien zur historischen Theologie, VIII (1926), 28\*.

<sup>9</sup> Ibid., p. 9\*. See also Martin Grabmann, Die Geschichte der scholastischen Methode, Freiburg i. Br., 1911, p. 45, note 1.

theless, took for granted that music as interpreted by Boethius had, together with the rest of the Quadrivium, its intermediate place between physics and metaphysics. Through their study of Boethius' work on music they also became aware of the ethical function which Boethius, as a spokesman of Platonism, imparted to the discipline. Boethius presented the two schools still in separation, showing on the one side the Platonic-Pythagorean Musica of his Quadrivium, on the other the commentaries on the Organon, while Aristotle inspired him to the task of reconciling the two great philosophic systems with each other. And whereas Boethius was not allowed to complete this task, the medieval musicians carried out the act of reconciliation. They, in fact, combined the ethical function which was derived from the Platonic music as an instrument, with the objective, systematic order which came from the Aristotelian music as an actual part of philosophy. Thus the interpretation medieval musicians cast upon the Musica of Boethius achieved one of his chief aims: to reconcile Plato with Aristotle.

Finally, a problem should be discussed which, despite its extraordinary historical significance, has been entirely neglected. What kind, what type of learned treatise is it that Boethius' Musica represents? Greek philosophy had passed on to him two types according to which a learned subject could be treated: the "exhortation" and the "introduction". Boethius was familiar with both. For each, Greek philosophers had established a definite outline and structure by which any writer had to abide. What is an "exhortation to study"? In the field of philosophy the writer of such a discourse addressed the general reader to whom "persuasion, consolation, and encouragement" were to be given. 10 Such a treatise was therefore written not for the sake of scholarship in the strict sense of the word, but in order to encourage the young student to devote himself to the study of philosophy. With the assumption that virtue is teachable, that knowledge-philosophy-and virtue are identical, philosophy is taken to be an end in itself; hence its study should not suffer from utilitarian considerations. The topics to be treated in an "exhortation" were such as to meet the intention of the work.

First, then, the writer showed that by comparison with other beneficial disciplines philosophy alone granted man the bliss of life, which is scarcely worth living unless meaning is found through

<sup>10</sup> Seneca, Epistolae, Loeb Classical Library, London, 1917-1925, Epistola 95, 65 (Vol. III, p. 99).

philosophy. But only purely theoretical, scientific study can ultimately yield knowledge and virtue. And Boethius assumes for the Musica of his Quadrivium the necessity of study, the beneficial effect, and the purely theoretical character. Second, the writer of an "exhortation" gave definitions of philosophy, of its task, and of its parts. In his treatise on the Quadrivium Boethius presents a definition of music, though in a somewhat disconnected manner. Third, the relationship of philosophy to other disciplines, to the rest of the liberal arts, was taken up. Although there was no general agreement on the matter, many an "exhortation to study" had shown the preparatory character of the liberal arts: "because they prepare the soul for the reception of virtue." And Boethius places all emphasis upon the ethical-educational power that the Musica of the Quadrivium holds over the preparation of the mind. Fourth, in an "exhortation" the sublime character of philosophy was derived from the natural disposition of man; for the noble, the divine, as well as the appetite for them, are inborn in man. And Boethius asserts that man possesses music as an innate quality; by devoting himself entirely to the theoretical study of Musica, man eliminates the possibility of a demoralizing influence of music. Fifth, the writer of an "exhortation" finally glorifies the metaphysical world, the character of which the study of philosophy was to reveal at last. Boethius declares that on the path towards the summit of perfection, music is the guide.

In applying this structure to the individual discipline such as music in the Quadrivium, we find that Boethius more or less closely followed the outline and purpose of an "exhortation". At any rate, in the general sections of all the mathematical treatises he clearly demonstrated the essential characteristics of such a work. Above all, the great stress Boethius placed on the side of the ethical significance of music has its prototype in the literature of the "exhortations". Boethius, himself a youth, dedicated the books on music to those of his own age, in order to stimulate them to the study of philosophy. In view of the fact that the "exhortations", Greek and Latin, influenced the structure of the Institutio Musica, we must conclude that Boethius did not design his work to be a textbook for use in the Roman rhetorical schools, as has always been taken for granted.

The time in which Boethius wrote his work on music repre11 Seneca, op. cit., Epistola 88, 20 (Vol. II, p. 361).

sented the very last phase of ancient literature in every field and form. The types of literature produced in the latter part of the 5th century often failed to show the traditional, that is, original, purity and clarity. Categories and types are often confusingly mixed, of course, when cultural epochs approach their end. Although Boethius' treatise on music had predominantly the character of an "exhortation", he allowed several features to enter which he drew from the type of an "introduction". An introductory treatise was schematically organized according to topics, headings, subject-matters. The number of topics varied. Among the preliminary ones there were subjects such as the essence of music, its usefulness, its origin, its history, its division, and so forth; in other words, questions of fundamental importance. Boethius did not go so far as to allow the topics to determine the organization of his work on music. But a few of the problems usually treated in an "introduction" were taken up and incorporated. They do not quite harmonize with the prevailing character of the treatise; they may even be somewhat disturbing, although they do not throw it out of proportion. The beginning and the end of Arithmetic and Music especially show the plan of the educational "exhortation" in all clarity. And here once more schools of thought may set the parting-line. For Boethius presented the type arranged properly according to the topics of an "introduction" for the first time in his commentary on Porphyry. Hence, the Quadrivium seems to stand out as an entity by itself, and to differ from the rest of Boethius' literary output.

The study of types of works on music, ancient and medieval, is not a matter that offers itself to purely statistical investigation. Were it merely that, it could surely be left at rest. But it has a more comprehensive significance. It holds an essential part of the history of musical thought and of ways of thinking. The typology of musical treatises is, in fact, the agent that in the end will best enable us to follow the narrow paths and often twisted roads along which the knowledge of music has travelled through the centuries.



From Pythagoras to the Turba philosophorum: Egypt and Pythagorean Tradition Author(s): Peter Kingsley  $\,$ 

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## FROM PYTHAGORAS TO THE *TURBA PHILOSOPHORUM*: EGYPT AND PYTHAGOREAN TRADITION

## Peter Kingsley

There was a time earlier this century when it was common to dismiss the reports about Pythagoras's travels to Egypt as just one more sign of the predilection for romantic fantasy among writers in late antiquity—even though the earliest references to Pythagoras's connections with Egypt date back to the fifth and fourth centuries BC. Some recent scholars, while duly acknowledging the 'inventiveness' of Greek biographical tradition, have adopted a more open-minded attitude to the possibility that Pythagoras did actually travel to Egypt.<sup>2</sup> And yet, even so, the surviving evidence has hardly been given the close attention it deserves. For example, it has been more or less ignored that the theme of Pythagoras travelling far and wide is already implicit in a statement by Heraclitus of Ephesus—who was certainly no romantic, who lived not long after Pythagoras himself, and who was ideally situated to hear local traditions about him considering that Ephesus was on the Asiatic coast opposite Pythagoras's home island of Samos. For Heraclitus, Pythagoras was someone who 'practised inquiry (historia) to a greater extent than any other men'. When we look at the meaning of this term historia, in Ionic Greek but also very often in later literature, we see that its chief and unmistakable implication is of investigations carried out through visiting distant places and people.<sup>3</sup> It is also worth noting that because historia as disinterested travel was naturally conducted to a large extent along the normal trade routes, juxtaposition of the terms emporia and historia—'trade' and 'inquiry'—was a commonplace in Greek literature. 4 As for Heraclitus's purpose in dwelling on Pythagoras's passion for historia, it was savagely polemical. He made fun of Pythagoras for looking for wisdom everywhere else except in the one place where according to Heraclitus it was to be found—inside oneself—and for failing to realise the truth, so elegantly formulated by Lao Tzu,

<sup>2</sup> So e.g. W. K. C. Guthrie, A History of Greek Philosophy, Cambridge 1962–81, i, pp. 173, 217f.

p. 131. For historia cf. Herodotus, Histories i.1, ii.19, 99; Plutarch, Theseus xxx.3, etc; Marcovich, op. cit., pp. 69f ('implies here "travelling and inquiry..."); A.-J. Festugière, Hippocrate, L'Ancienne médecine, Paris 1948, p. 62 ('inquiry conducted by means of interrogation of the inhabitants of the countries visited'); J. Kerschensteiner, Platon und der Orient, Stuttgart 1945, p. 29. On the importance of viewing Heraclitus's use of language against the background of Ionic Greek see C. H. Kahn, The Art and Thought of Heraclitus, Cambridge 1979, p. 99

p. 92.

<sup>4</sup> Cf. e.g. Plutarch, *Solon* ii.1 (compare Plutarch's language with Heraclitus B35, B40, B129, ed. Diels and Kranz, op. cit., i, pp. 159, 160, 180f); idem, *De defectu oraculorum* 419e; Aristides, ed. W. Dindorf, Leipzig 1829, i, pp. 156.13–14, 508.21–3; Theodoretus, *Historia ecclesiastica* i.23.2.

<sup>&</sup>lt;sup>1</sup> Cf. e.g. T. Hopfner, Orient und griechische Philosophie, Leipzig 1925; A.-J. Festugière, La révélation d'Hermès Trismégiste, i, 2nd edn, Paris 1950, pp. 19–44 ('le mirage oriental'). For the 5th- and 4th-century references (Herodotus, Histories ii.81; Isocrates, Busiris 28) see P. Kingsley, 'The Greek Origin of the Sixth-Century Dating of Zoroaster', Bulletin of the School of Oriental and African Studies, liii, 1990, p. 247 n. 11; idem, Ancient Philosophy, Mystery and Magic, Oxford 1995, ch. 17.

<sup>&</sup>lt;sup>3</sup> Heraclitus B129, ed. H. Diels and W. Kranz, Die Fragmente der Vorsokratiker, 6th edn, Berlin 1951–2, i, pp. 180f (ἱστορίην ἤσκησεν ἀνθρώπων μάλιστα πάντων). The fragment is undoubtedly genuine: M. Marcovich, Heraclitus, Mérida 1967, p. 68; W. Burkert, Lore and Science in Ancient Pythagoreanism, Cambridge, Mass. 1972,

that 'the further one goes the less one knows: the sages acquire their knowledge without travel'.<sup>5</sup> And yet Heraclitus would only have been able to make fun of Pythagoras in this way if traditions about him as a traveller, explorer and collector of wisdom from distant parts were already in existence, among people who will have known him best, by the late sixth century BC.

The Samians were phenomenal traders; they appear, for instance, to have been the first Greeks to exploit commercial possibilities in Andalusian Spain. <sup>6</sup> But where Pythagoras himself is concerned we can be more specific, thanks to one significant but neglected piece of evidence. We are told that his father, Mnesarchus, was a gemcutter by trade; the information is highly credible. What is interesting about this detail is the fact that, at precisely the period when Pythagoras's father is likely to have been living, the island of Samos played a major role in the birth of the Greek art of gem-engraving. In the 570s and 560s BC Greeks seem to have started learning the techniques of working hard stones from easterners, notably Phoenicians. For at least the first generation or two of workers—and it is important to bear in mind that Pythagoras would as a matter of course have been trained to inherit his father's craft—this will inevitably have involved travel in the eastern Mediterranean for the purpose of learning, not to mention a very close relationship with foreign traders and trading as far as obtaining materials was concerned. Once again we are brought back to the theme of trade, travel and learning from foreigners—which in connection with sixth-century Samos is hardly surprising.

Speaking in general, of all the options for travel available to anyone from Samos in the sixth century BC—and there were many<sup>9</sup>—there was one which was by far the most obvious and the likeliest: Egypt. The remarkably close trade links between Egypt and Samos seem to have begun around the start of the seventh century. As a result, Samians found themselves on the receiving end in technology and artistic skills, not to mention artefacts; this continued into the sixth century, with a perpetual incoming stream of curiosities and crafts. By the reign of Amasis (570–526 BC), which probably coincided with Pythagoras's youth and coming of age, the links between Egypt and Samos were closer than ever—with Egypt the island's single most important exchange partner. And it was not just a matter of receiving useful objects or specialised skills from the Egyptians: by at least 570 the Samians already had settlements, and permanent temples, on the Nile delta itself. Needless to say,

<sup>&</sup>lt;sup>5</sup> Tao Te Ching, ch. 47. Cf. Heraclitus B40, B45, B101 (ed. Diels and Kranz, as in n. 3, i, pp. 160, 161, 173). For B35 (ibid., p. 159) see Guthrie (as in n. 2), i, p. 417.

<sup>&</sup>lt;sup>6</sup> R. Carpenter, *Beyond the Pillars of Hercules*, London 1973, pp. 52–8. It will be noted that Pythagoras is credited in later tradition with visiting 'Iberia' (Iamblichus, *On the Pythagorean Life* 151).

<sup>7</sup> For the name Mnesarchus see Heraclitus B129 (Πυθαγόρης Μνησάρχου ἱστορίην ἤσκησεν...: cf. above, n. 3); Herodotus, *Histories* iv.95; Guthrie (as in n. 2), i, p. 173 with n. 3. Mnesarchus as gem-cutter: Diogenes Laertius, *Lives* viii.1 = Hermippus, ed. F. Wehrli, Basle 1974, fr. 19; Apuleius, *Florida* 15; *Suda*, s.v. Πυθαγόρας; Schol. Plato, *Republic* 600b; Guthrie, op. cit., i, pp. 173, 176f. Details of this kind from the pen of Hermippus are not to be laughed at (cf. Burkert, as in n. 3, pp. 102f with n. 31; also H. Jacobson, 'Hermippus, Pythagoras

and the Jews', Revue des études juives, cxxxv, 1976, pp. 145–9), and in this particular case the independent evidence for gem-engraving and related skills on Samos during the mid-6th century BC offers important corroboration: see J. Boardman, Greek Gems and Finger Rings, London 1970, pp. 157f, 404.

<sup>&</sup>lt;sup>8</sup> See Boardman, op. cit., pp. 139–41; idem, *The Greeks Overseas*, 3rd edn, London 1980, p. 71. For the dating of Pythagoras (and, consequently, of his father), see G. S. Kirk, J. E. Raven and M. Schofield, *The Presocratic Philosophers*, 2nd edn, Cambridge 1983, pp. 164, 224. For Pythagoras inheriting his father's craft cf. Guthrie's comments (as in n. 2), i, pp. 173, 176f.

comments (as in n. 2), i, pp. 173, 176f.

<sup>9</sup> Cf. e.g. P. Kingsley, 'Greeks, Shamans and Magi', Studia Iranica, xxiii, 1994, pp. 187–98.

<sup>&</sup>lt;sup>10</sup> G. Shipley, A History of Samos, Oxford 1987, pp. 43, 45, 55–61, 73, 86–8.

the early reports of close affinities between Egyptian and Pythagorean cult or, more specifically, of Pythagorean indebtedness to Egypt which we find already in Herodotus and Isocrates<sup>11</sup> must in the first instance be assessed against this background of relations between Egypt and Pythagoras's native island. As for the modern idea of dismissing accounts of Pythagoras's links with Egypt as mere fantasies about the superiority of oriental wisdom—what Festugière defined as 'le mirage oriental' 12—it requires some very radical rethinking.

However, there is yet another point which in this connection has apparently been overlooked. Paradoxically, it must also be borne in mind that Pythagoras is likely to have come into contact with traditions of ultimately Egyptian origin not in Egypt itself but elsewhere—after he had migrated to his new home in southern Italy. We can begin with the famous 'Orphic' gold plates, or more accurately pieces of gold foil which were inscribed with directions for finding one's way in the other world and with promises for attaining immortality. Intended to accompany the dead person into the underworld, they have been discovered in graves across much of the Greek-speaking world—but above all in southern Italy. The ideas they contain represent a vital aspect of the religious landscape in the Greek West which Pythagoras himself will have encountered after he migrated, and which early Pythagorean tradition rapidly assimilated and made its own. 13 These gold plates bear remarkable similarities to ancient Egyptian ideas concerning the afterlife, and as a result have often been assumed to have an Egyptian background.<sup>14</sup> Günther Zuntz, it is true, made a brave attempt in his work on Persephone to deny any connection between the Italian and Egyptian phenomena; 15 but the attempt was in vain. He was anxious in particular to claim a 'difference of attitude and purpose' between the Italian and Egyptian texts, on the grounds that the gold plates were strictly religious as opposed to magical; and yet this wish to free the Italian gold plates from any associations with the 'base' world of magic is plainly contradicted by the evidence. 16 As far as the textual content of the gold plates is concerned, Zuntz felt bound to acknowledge the 'striking' similarities with spells in the Egyptian so-called *Book of the Dead*. But at the same time he drew attention to certain supposed differences<sup>17</sup> which are in fact unreal: in spite of his remarks to the contrary, we are presented in both cases with the same fundamental themes of guardians in the underworld blocking and challenging the soul that demands refreshment, and of the soul stating its identity by claiming it is one of the gods or is a star in heaven. 18 Differences in points of detail there certainly are; but far from being proof that the Italian and Egyptian texts are

 $<sup>^{11}\,</sup>$  See above, n. 1; also Burkert (as in n. 3), pp. 127f.

<sup>&</sup>lt;sup>12</sup> See above, n. 1.

<sup>&</sup>lt;sup>13</sup> Regarding the nature of the gold plates, their links with Pythagoreanism, and the significance of the corrupt state of their texts for dating the tradition they belonged to, see Kingsley, *Ancient Philosophy* (as in n. 1), chs 17, 19; also Burkert's comments (as in n. 3), pp. 112f.

<sup>&</sup>lt;sup>14</sup> Cf. e.g. U. von Wilamowitz-Moellendorff, Der Glaube der Hellenen, ii, Berlin 1932, pp. 202f; M. L. West, Early Greek Philosophy and the Orient, Oxford 1971, pp. 65f with his further comments, 'Zum neuen Goldblättchen aus Hipponion', Zeitschrift für Papyrologie und Epigraphik, xviii, 1975, p. 229 n. 2; W. Burkert, 'Le laminette auree:

da Orfeo a Lampone', *Orfismo in Magna Grecia* (Atti del 14º Convegno di studi sulla Magna Grecia), Naples 1975, pp. 86f; idem, *Greek Religion*, Oxford 1985, p. 294. <sup>15</sup> G. Zuntz, *Persephone*, Oxford 1971, pp. 370–6, 385–93.

<sup>&</sup>lt;sup>16</sup> Kingsley, Ancient Philosophy (as in n. 1), ch. 19.

<sup>&</sup>lt;sup>17</sup> Zuntz (as in n. 15), pp. 374f.

<sup>18</sup> With Zuntz's B1-2 (as in n. 15, pp. 358-61, 367), cf. e.g. Book of the Dead, chs 58f, 122 (P. Barguet, Le livre des morts des anciens Égyptiens, Paris 1967, pp. 93, 155f); and see also Papyri Graecae magicae, 2nd edn, ed. K. Preisendanz and A. Henrichs, Stuttgart 1973-4, IV.574-5, with R. Merkelbach's note, Abrasax, iii, Opladen 1992, p. 239.

unrelated, they can just as easily be explained as a result of transformation of themes or motifs due to the natural—and normal—process of cultural contacts and adaptation. 19

There is one other point, however, which Zuntz failed to take into account: the most decisive factor of all. This is the discoveries made in tombs of the seventh to fifth centuries BC, in both Sardinia and Carthage, of strips of gold foil. The strips themselves are Phoenician and Punic in origin, but are engraved with Egyptian figures and rolled up inside amulet tubes usually sculpted at the top with representations of Egyptian gods. These amulets and pieces of gold foil provide the missing link—formally, geographically and chronologically—between the Egyptian and the south-Italian material, and clearly testify to a curve of influence from Egypt up to southern Italy via the Phoenicians and Carthage. 20 Yet they are by no means the only links between Egypt and the Greek West. Evidence of heavy Egyptian influence in Italy itself, from the eighth and seventh centuries BC onwards, is now well known and well documented.<sup>21</sup> And there are also, for example, the Egyptian magical objects—including one representing Isis suckling Horus—which have been found in the famous Sicilian sanctuary of the Gaggera at Selinus. Dating back to the seventh century BC, these too are a result of Phoenician and Carthaginian intermediaries.<sup>22</sup> The religious links between Selinus and southern Italy were very close. 23 As for the representation of Isis suckling Horus, it offers a striking parallel to the imagery of the reborn initiate suckling at the breasts of Persephone in imitation of her son Dionysus: imagery which made Zuntz 'shudder', and which he endeavoured to ignore, but which takes us to the heart of the message engraved on the Orphic gold plates.<sup>24</sup> On a more general level, these various links between Egypt and both Sicily and southern Italy are obviously relevant to the occurrence of Egyptian ideas in Orphic mythology. 25 It was in Sicily and southern Italy that Orphic mythology had its literary roots, often in recognisably Pythagorean circles; and the practice of referring to Orphic traditions as 'really Egyptian and Pythagorean' (ἐοῦσι Αἰγυπτίοισι καὶ Πυθαγορείοισι) goes back to Herodotus in the fifth century BC.26

Neither Pythagoras nor the early Pythagoreans grew up in a self-enclosed world of purely Greek culture. To assume that they did is to contribute to creating the real

<sup>&</sup>lt;sup>19</sup> See on this point Burkert's remarks, 'Itinerant Diviners and Magicians: A Neglected Element in Cultural Contacts', The Greek Renaissance of the Eighth Century BC: Tradition and Innovation, ed. R. Hägg, Stockholm 1983, p. 119; idem, The Orientalizing Revolution: Near Eastern Influence on Greek Culture in the Early Archaic Age, Cambridge, Mass. 1992, p. 7 with n. 31; and D. Pingree, 'MUL.APIN and Vedic Astronomy', *DUMU-E*<sub>2</sub>–*DUB*– BA-A, Studies in Honor of Åke W. Sjöberg, Philadelphia 1989, pp. 439-45.

<sup>&</sup>lt;sup>20</sup> A. A. Barb, 'Mystery, Myth, and Magic', The Legacy of Egypt, 2nd edn, ed. J. R. Harris, Oxford 1971, pp. 148-51 with fig. 2; R. Kotansky, 'Incantations and Prayers on Inscribed Greek Amulets', *Magika Hiera*, ed. C. A. Faraone and D. Obbink, New York 1991, pp. 114f with

<sup>&</sup>lt;sup>21</sup> See G. Hölbl, Beziehungen der ägyptischen Kultur zu Altitalien, Leiden 1979.

<sup>&</sup>lt;sup>22</sup> G. Sfameni Gasparro, I culti orientali in Sicilia, Leiden 1973, pp. 50-2, 198f. Cf. also ibid, pp. 1-12; B. Pace, Arte e civiltà della Sicilia antica, i, Milan 1935, p.

<sup>&</sup>lt;sup>23</sup> Zuntz (as in n. 15), pp. 173-7.

<sup>&</sup>lt;sup>24</sup> Kingsley, Ancient Philosophy (as in n. 1), ch. 17;

Zuntz, op. cit., p. 324. <sup>25</sup> S. Morenz, 'Ägypten und die altorphische Kosmogonie', Aus Antike und Orient: Festschrift Wilhelm Schubart, Leipzig 1950, pp. 64–111; J. Bergman, *Ich bin Isis*, Uppsala 1968, pp. 33–5; and cf. also L. Motte, 'Orphica Aegyptiaca I', Langues orientales anciennes, philologie et linguistique, ii, 1989, pp. 253-72.

<sup>&</sup>lt;sup>26</sup> Kingsley, Ancient Philosophy (as in n. 1), chs 10-12, 17; Herodotus, Histories ii.81 with n. 1 above.

mirage: not *le mirage oriental* but *le mirage grec*. If we wish to understand the historical background to Pythagoreanism, we need to assess all the available information with care; no detail is too small to be disregarded. For instance, in view of the place occupied by Phoenicia and Carthage in the pattern of evidence considered above, it is worth noting that Pythagoreans are more than once brought into contact with Carthage—either as including Carthaginians among their number or as being taught by Carthaginians.<sup>27</sup> Particularly interesting in this regard is evidence suggesting that Archytas, Plato's Pythagorean friend and mentor, was taught mechanics by a Teucer from Carthage: one more detail not to be ignored.<sup>28</sup>

Π

Some four hundred years after Pythagoras, probably in the late second century BC, we encounter the figure of Bolus of Mendes, from the Nile delta in Egypt. <sup>29</sup> Very little is known about him, but that little is particularly significant. On the one hand the evidence suggests that he played an important role as a transmitter of Pythagorean traditions, and specifically of miracle stories about wonder-workers of antiquity —with Pythagoras himself taking centre-stage. <sup>30</sup> What is more, Bolus also produced

<sup>27</sup> Iamblichus, On the Pythagorean Life 128 (Miltiades); Diogenes Laertius, Lives viii.79. In the Diogenes passage, Archytas the mechanic is to be identified with Archytas the Pythagorean: the doubling of people of the same name is plainly due to Diogenes using different sources which he failed to understand. See on this point A. Mieli, I presocratici, i, Florence 1916, pp. 341f n. 5; P. Wuilleumier, Tarente, Paris 1939, p. 576; for the identical phenomenon in the Suda, J. H. Waszink, art. 'Bolos', Reallexikon für Antike und Christentum, ii, 1954, col. 502; and—for its recurrence elsewhere in Diogenes—Lives viii.46 with A. Delatte's comments, La Vie de Pythagore de Diogène Laërce, Brussels 1922, pp. 251f, and Burkert (as in n. 3), pp. 118f, 181 n. 111.

<sup>28</sup> Diogenes Laertius, *Lives* viii.79 with n. 27 above. The detail is certainly not to be sneezed at: cf. Diodorus Siculus, *Bibliotheca* xiv.41.3, and H. Diels, *Antike Technik*, 2nd edn, Leipzig 1920, pp. 84f. For Archytas as mechanic, and for the influence of this aspect of Pythagoreanism on Plato, see Kingsley, *Ancient Philosophy* (as in n. 1), chs 11f. The assertion that Phoenicians and Carthaginians had no original ideas 'because they were more adept at taking over than discovering things' (E. W. Marsden, *Greek and Roman Artillery*, i, Oxford 1969, p. 54) is a graphic example of cultural prejudice writ large. Cf. M. Bernal's comments, *Black Athena*, i, London 1987, pp. 337–64, 374–99, esp. 345f.

<sup>29</sup> On the dating of Bolus see P. M. Fraser, *Ptolemaic Alexandria*, Oxford 1972, i, p. 440; J. Needham, *Science and Civilisation in China*, v.4, Cambridge 1980, p. 325.

<sup>30</sup> Cf. the Suda, s.v. Βῶλος Μενδήσιος Πυθαγόρειος· Περὶ τῶν ἐκ τῆς ἀναγνώσεως τῶν ἱστοριῶν εἰς ἐπίστασιν ἡμᾶς ἀγόντων, Περὶ θαυμασίων, plus Apollonius's Historiae mirabiles 1–6 together with the incipit to the work (Βώλου) and e.g. Burkert (as in n. 3), p. 141 nn. 115f; also H. Demoulin, Épiménide de Crète, Brussels 1901, pp. 71f. Regarding the two titles mentioned in the Suda, there is no reason to follow those (e.g. A. Giannini, 'Studi sulla paradossografia greca', Acme, xvii, 1964, p. 109 and

n. 50) who assume they were alternative names for the same work. The first will have meant in origin something like 'Concerning Matters Demanding our Attention when Reading Stories', and the work was probably written in the form of a commentary to the Περί θαυμασίων—in the same way that Bolus's Χειρόκμητα is said to have been written as a commentary on his Φυσικά (Vitruvius, De architectura ix.1.14; R. Halleux, Les alchimistes grecs, i, Paris 1981, pp. 65f with n. 3). For the ίστορίαι of the longer title cf. e.g. Apollonius's Ἱστορίαι θαυμάσιαι ('Wonderful Stories'); the recent trend for translating the title as 'Sur ce qui, dans la lecture des histoires, nous conduit au savoir' (Halleux, op. cit., p. 63; J. Letrouit, 'Chronologie des alchimistes grecs', Alchimie: art, histoire et mythes, ed. S. Matton, Paris 1995) involves misreading ἐπίστασιν as ἐπιστήμην.

Regarding the *incipit* to Apollonius's work, it is most naturally interpreted as suggesting a large debt to Bolus for the material that follows: cf. H. Diels, Kleine Schriften zur Geschichte der antiken Philosophie, Darmstadt 1969, pp. 42f (orig. publ. 1891); Giannini, art. cit., p. 123 n. 144; and esp. Fraser (as in n. 29), ii, pp. 638f n. 527. Of obvious relevance here is the fact that §31 gives a report about Theophrastus which recurs exactly in Stephanus of Byzantium, Ethnica, s.v. Ἄψυνθος—directly after the mention of Bolus's name. See below, n. 52. Note also, firstly that in both cases the report is not a verbatim quotation, so Stephanus cannot have referred directly to the text of Theophrastus; and secondly that Stephanus adds the book number of Theophrastus which is missing from Apollonius, so he was almost certainly using Apollonius's source rather than Apollonius. One consequence of Bolus not being cited by name in the passage of Apollonius (who pedantically cites detailed authorities throughout the body of his work: Giannini, art. cit., p. 123) is that Bolus's influence on Apollonius's work will—as the incipit also suggests—have been both extensive and profound.

works very closely related to the Pythagoreanising literature of his time.<sup>31</sup> On the other hand he appears to have been a crucial figure in shaping the subsequent development of Graeco-Egyptian alchemy, and it is no doubt largely as a result of his influence that we find Pythagoreanism and alchemy starting to overlap. He also shows the closest of affinities with the world of the Graeco-Egyptian magical papyri, particularly on the subject of dream oracles and divination.<sup>32</sup>

Bolus's importance for our understanding of the history of Pythagorean tradition is a matter I have considered elsewhere.<sup>33</sup> Here I would like to focus instead on setting in order the main evidence for his links with later alchemical tradition.

Ever since the publication of a highly influential paper by Wilhelm Kroll in 1934, it has become popular to deny any connection between Bolus of Mendes and the beginnings of alchemy: in the recent words of Jackson Hershbell, 'there is no evidence' to support the conclusion that Bolus 'was interested in metallurgical or alchemical matters'. <sup>34</sup> In fact this is very far from being the case. First, there is the work called *Cheirokmēta*—literally 'Hand-made Products'—which is attributed to Bolus by Columella. <sup>35</sup> Clearly significant here is the use of this same term *cheirokmēta*—both as a technical expression and as a book-title—in later alchemical literature, and in particular in the work of that key figure for our understanding of Graeco-Egyptian alchemy: Zosimus of Panopolis. <sup>36</sup> Second, there is Columella's implication

<sup>31</sup> Burkert, 'Hellenistische Pseudopythagorica', *Philologus*, cv, 1961, pp. 232f. Cf. also A. Della Casa, *Nigidio Figulo*, Rome 1962, pp. 124–6.

Bolus wrote on the technique of lamp-divination (Suda, s.v. Βῶλος Μενδήσιος: Περὶ σημείων των έξ... λύχνου). For use of this technique in the magical papyri often as an integral part of ritual for divination by dreams-see Papyri Graecae magicae, 1st edn, ed. K. Preisendanz, iii, Leipzig 1941, p. 89 s.vv. ελλύχνι, ελλυχνιάζειν, ελλύχνιον, and p. 132 s.vv. λυχνία through to λύχνος; ibid., 2nd edn (as in n. 18), LXII.1-24; F. L. Griffith and H. Thompson, The Demotic Magical Papyrus of London and Leiden, i, London 1904, V.3-VIII.11, XVI.1-XVIII.6, XXV.1-22, XXVII.13-36, and verso XVIII, XXIV, XXXI; S. Eitrem, 'La théurgie chez les Néoplatoniciens et dans les papyrus magiques', Symbolae Osloenses, xxii, 1942, pp. 54f; idem, 'Dreams and Divination in Magical Ritual', Magika Hiera (as in n. 20), pp. 176-81; J. H. Johnson, 'Louvre E3229: A Demotic Magical Text', Enchoria, vii, 1977, pp. 58, 90f; R. W. Daniel and F. Maltomini, Supplementum magicum, ii, Opladen 1992, pp. 196f, 209f. On the use of lamps in Egyptian ritual see F. Lexa, La magie dans l'Égypte antique, Paris 1925, i, p. 111; J. G. Griffiths, Apuleius of Madauros, The Isis-Book, Leiden 1975, pp. 183f, 195f, 305f, 353. For the 'dream oracle of Pythagoras and Democritus' in Papyri Graecae magicae VII. 795, see A.-J. Festugière, L'idéal religieux des grecs et l'Évangile, 2nd edn, Paris 1981, p. 282n; A. Bernand, Sorciers grecs, Paris 1991, p. 26.

33 Ancient Philosophy (as in n. 1), chs 20f.

35 De re rustica vii.5.17.

<sup>36</sup> See the *Suda*, s.v. Ζώσιμος 'Αλεξανδρεύς (Χειρόκμητα). In the surviving manuscripts of Zosimus we find the words χειρότμητα (M. Berthelot and C.-E. Ruelle, Collection des anciens alchimistes grecs, Paris 1887-8, ii, p. 226.16, where Letrouit, as in n. 30, notes that MS 'M' has the form χερότμητα; cf. also M. Berthelot, La chimie au moyen âge, Paris 1893, ii, p. 239) and χειροτμήματα (Berthelot and Ruelle, op. cit., ii, p. 239.9; cf. p. 209.13-14). First, however, it will be noted that in these passages χειρότμητα or χειροτμήματα (literally 'things cut by hand') is not as appropriate to the context as would be χειρόκμητα ('things produced or wrought by hand'). Second, and more importantly, χειρόκμητος and χειρότμητος are routinely confused in Greek manuscripts: cf. e.g. Strabo, Geography i.3.18, where the manuscript that gives χειρόκμητοι has just provided another superior reading; in Philo of Alexandria, Quod deus sit immutabilis 25, De decalogo 66 and 76, De specialibus legibus i.22 and 58, ii.1, where the isolated manuscript that gives χειρότμητον instead of χειρόκμητον provides our only text for the end of the book and there gives χειροτμήτοις (ii.256) and χειρότμητα (ii.258) uncontested, De virtutibus 40 and 220, De aeternitate mundi 10, Legatio ad Gaium 290 and 310, where the χειρότμητον of MS 'O' has been corrected in the manuscript itself to χειρόκμητον in agreement with all other manuscripts; and see also Vitruvius, De architectura ix.1.14 (Χειροτομητων). And third, in manuscripts in general the word χειρόκμητα is almost always corrupted in some way or another: cf. e.g., in the case of Bolus, Diels and Kranz (as in n. 3), ii, apparatus to p. 212.5, 7, 14. Finally it will be noted that in the occurrence of the word χειροτμήματα at the start of Zosimus's Final Quittance (Berthelot and Ruelle, ii, p. 239.9), MS 'M'-i.e. Marcianus graecus 299: the oldest and most valuable manuscript for Zosimus—contains a cross

<sup>&</sup>lt;sup>34</sup> W. Kroll, 'Bolos und Demokritos', *Hermes*, lxix, 1934, pp. 228–32; J. P. Hershbell, 'Democritus and the Beginnings of Greek Alchemy', *Ambix*, xxxiv, 1987, p. 8. The denial of any connection betwen Bolus and the beginnings of alchemy continues to be maintained by Letrouit (as in n. 30). See also below, n. 41, ad fin.

that Bolus wrote this work under the pseudonym of Democritus: we will be looking shortly at what exactly Columella has to say. Here there is no ignoring the relevance of this detail to the practice in early Graeco-Egyptian alchemy of falsely attributing works to Democritus—including, by implication, works on cheirokmēta. Once again, our crucial witness is Zosimus of Panopolis.<sup>37</sup> Third, in Bolus's On Sympathies and Antipathies we are introduced—via the person of Democritus—to the teacher-figure Ostanes, the Persian Magus.<sup>38</sup> The role of Ostanes in alchemical literature—here, too, as the teacher of Democritus—is well known. 39 Finally, also relevant to Bolus's links with alchemy is the ascription 'This one too Anaxilaus attributes to Democritus' in what can be described as the 'proto-alchemical' recipes of the famous Stockholm papyrus. 40 Anaxilaus's reference to Democritus is not, in itself, a sufficient pointer to Bolus. But when we consider Bolus's involvement in the forging of works by Democritus, plus the evidence indicating that Anaxilaus—known as a Pythagorean and magus, and banished from Rome in 28 BC—was dependent on the work of Bolus, we are left with one further piece of evidence for Bolus's involvement in the earliest development of alchemy.<sup>41</sup>

The precise nature of Bolus's relationship to supposed writings of Democritus deserves some close examination, because it is here that problems have arisen in recent years. The work *On Sympathies and Antipathies* is attributed to Bolus by the *Suda*, to 'Bolus the Democritean' by a scholiast on Nicander, and to Democritus by Tatian.<sup>42</sup> The *Cheirokmēta* is attributed to Democritus by Vitruvius and Pliny; but, in a passage of crucial importance, Columella refers to

above and between the two letters oτ, indicating that someone suspected the reading was wrong (my thanks for this information to Father H. D. Saffrey). The situation here is obviously to be compared with the correction, just mentioned, of χειρότμητον at Philo, *Legatio* 310.

<sup>37</sup> Zosimus, *Final Quittance* 1–5, ed. Festugière (as in n. 1), i, pp. 363.5–365.22; cf. Berthelot and Ruelle, op. cit., ii, pp. 239.4–242.18. For the word χειρόκμητα see above, n. 36; and for Democritus and alchemy cf. e.g. Berthelot and Ruelle, ii, pp. 41–102, 119–36, 148–69.

<sup>38</sup> Tatian, *Oratio ad Graecos* 17 = J. Bidez and F. Cumont, *Les mages hellénisés*, Paris 1938, ii, p. 294.8–14. Cf. R. Beck, 'Thus Spake Not Zarathuštra', in M. Boyce and F. Grenet, *A History of Zoroastrianism*, iii, Leiden 1991, p. 560 with n. 232.

<sup>39</sup> Bidez and Cumont, op. cit., i, pp. 198–212; Needham (as in n. 29), v.4, p. 335; Beck, art. cit., p. 561 with n. 237.

 $^{40}$  Papyrus Holmiensis 2, ed. Halleux (as in n. 30), p. 110.11–13 (εἰς Δημόκριτον ἀναξίλαος ἀναφέρει καὶ τόδε) with pp. 62–9. On the relation between this papyrus and later alchemy see ibid., pp. 24–30, 70–7; Hershbell (as in n. 34), p. 18 n. 44.

<sup>41</sup> For Anaxilaus of Larissa see M. Wellmann, *Die* ΦΥΣΙΚΑ des Bolos Demokritos und der Magier Anaxilaos aus Larissa, i, Berlin 1928, p. 53; Burkert (as in n. 31), p. 226 with n. 5. There can be no real doubt that the Anaxilaus mentioned in the Stockholm papyrus is identical with the magician Anaxilaus of Larissa. For example, not only were Παίγνια—'Games' or 'Amusing

Tricks'-attributed to 'Democritus' (Diels and Kranz, as in n. 3, ii, pp. 220f, Δημοκρίτου παίγνια) but a work of the same name is also known to have been written by Anaxilaus of Larissa (Halleux, as in n. 30, p. 69 with nn. 5f): a connection of obvious relevance to the appeal of 'Anaxilaus' to 'Democritus' in the papyrus. For Anaxilaus of Larissa's links with Bolus in particular see Waszink (as in n. 27), cols 504, 506; Burkert, op. cit., p. 233. Also worth noting in this regard is the specific point that Anaxilaus in his Παίγνια—just like Bolus before him—wrote in detail about the magical uses of lamps (for Anaxilaus see Wellmann, op. cit., p. 78, in lucerna, in ellychniis; for Bolus, above, n. 32). For the connections between 'games' or παίγνια, 'paradoxographical' literature or wonder stories, and the beginnings of Graeco-Egyptian alchemy, cf. Halleux, op. cit., pp. 70-2 (Africanus), plus Wellmann's commentary to ll. 2 and 11 of the Africanus text that he reproduces, op. cit., p. 79. These links are crucial for our understanding of the origins of Western alchemy.

<sup>42</sup> Suda, s.v. Βῶλος Μενδήσιος; Schol. Nicander, Theriaca 764; Tatian, Oratio ad Graecos 17 (cf. also Columella, De re rustica xi.3.64). It will be noted that, in the Suda, the work is attributed to 'Bolus the Pythagorean' (Diels and Kranz, as in n. 3, ii, p. 211.1–3): a further confirmation that the two Bolus lemmata in the Suda—the one for 'Bolus Democritus', the other for 'Bolus the Pythagorean'—both refer to one and the same writer. Cf. also above, n. 27; Kingsley, Ancient Philosophy (as in n. 1), ch. 20.

that famous author of the Egyptian race, Bolus of Mendes, whose contrivances (*commenta*) —called *Cheirokmēta* in Greek—are published (*produntur*) under the false name of Democritus.<sup>43</sup>

Kroll has won wide acceptance for his claim that 'Bolus is nowhere in the ancient sources accused of falsification'. 44 However, this is to exploit unfairly the ambiguity of Columella's wording and to avoid the inevitable conclusion that the person first responsible for 'publishing' the *Cheirokmēta* under the Democritus-pseudonym was none other than Bolus himself. 45 That Bolus was by no means innocent of this 'fraud' is in fact clear from Vitruvius, who mentions how Democritus was presented in the Cheirokmēta as—quite literally—giving the seal of his approval to the procedures listed in it: an obvious fiction.<sup>46</sup> The same type of fiction emerges from Tatian's report that On Sympathies and Antipathies presented Democritus as boasting, no doubt in the first person, about his magus-teacher Ostanes. 47 Here, again, later alchemical literature provides important analogies in the vividly dramatic settings which it supplies for Democritus's accounts of his experiences and encounters with Ostanes. 48 But that leaves us with the strange ambiguity of Columella's phrasing. What has not been noted here is that this ambiguity of Columella's circumlocution is precisely in keeping with the passage as a whole. The crucial word in what he says is commenta, which in classical Latin does not mean 'commentaries' but 'contrivances'. 49 There is an obvious pun here on cheirokmēta ('hand-made products'); but that is not all. With its dual implication of falsity and esoteric knowledge,<sup>50</sup> the word was ideally suited to evoke the Romans' profoundly ambiguous attitude towards the mysterious wisdom of Egypt. That is exactly how we find it used in a passage where Martianus Capella refers to the 'Aegyptiorum commenta': a passage which has been very competently explained by Luciano Lenaz.<sup>51</sup> In other words, it is no accident at all that Columella specifically presents Bolus as 'that famous author of the Egyptian race' ('Aegyptiae gentis auctor memorabilis'). His mention of contrivances, of Bolus as an Egyptian, and of falsification all hang together and cannot be separated one from the other.

These points should be enough to reinstate Bolus of Mendes as forger of works by Democritus which were to provide a major impetus for the dawning science of alchemy. But a little more tidying up still remains to be done. Kroll made the further mistake of claiming that, apart from supposedly never being accused of forging works by Democritus, Bolus 'also could not have done so considering that he cited authorities who were notoriously younger than Democritus'—namely

<sup>&</sup>lt;sup>43</sup> Vitruvius, *De architectura* ix.1.14; Pliny, *Historia naturalis* xxiv.102.160; Columella, *De re rustica* vii.5.17.

<sup>44</sup> Kroll (as in n. 34), p. 230.

<sup>&</sup>lt;sup>45</sup> For Columella's word *produntur*, 'published', cf. Tacitus, *Annals* xiii.20.

<sup>&</sup>lt;sup>46</sup> Vitruvius, *De architectura* ix.1.14 ('...in quo etiam utebatur anulo...'), with Diels in Diels and Kranz (as in n. 3), ii, p. 212.6 apparatus.

<sup>&</sup>lt;sup>47</sup> Tatian, *Oratio ad Graecos* 17 = Bidez and Cumont (as in n. 38), ii, p. 294.8–14. Cf. Beck (as in n. 38), pp. 560f with nn. 232, 234.

 $<sup>^{48}</sup>$  Berthelot and Ruelle (as in n. 36), ii, pp. 42.21–43.24 (reading 'Οστάνης with Diels for οὕτ' ἄν τις at p. 43.15–16), 53.18–54.11, 57.6–13.

<sup>&</sup>lt;sup>49</sup> Cf. also Pliny, *Historia naturalis* xix.23.68 with Columella, *De re rustica* xi.3.53—again referring to Bolus the Egyptian.

<sup>&</sup>lt;sup>50</sup> Falsity: Pliny, *Historia naturalis* xxviii.12.47. Esoteric knowledge: Firmicus Maternus, *Mathesis* vii.1.3; Martianus Capella, *De nuptiis Philologiae et Mercurii* ix.897.

<sup>51</sup> Martianus Capella ii.102; L. Lenaz, Martiani Capellae De nuptiis Philologiae et Mercurii liber secundus, Padua 1975, p. 64 n. 219.

Theophrastus. The argument seems eminently logical, and has been viewed as decisive by a number of recent scholars.<sup>52</sup> The crucial fact which has been missed is that it was almost certainly in his work on miracle stories that Bolus quoted Theophrastus,<sup>53</sup> and there is no reason at all to assume that he adopted the same practice in works he wrote under the name of Democritus. This point was already made in the nineteenth century, and repeatedly subsequently by Felix Jacoby.<sup>54</sup> It should be added that Bolus's work on wonders belonged to the Alexandrian tradition of 'paradoxography' in which it was positively expected that the author cite his sources: this was a particular convention of the literary genre,55 and has no bearing whatever on any other of Bolus's works. At the same time, it is worth remembering that obvious anachronisms were by no means exceptional occurrences in ancient forgeries.<sup>56</sup> Equally untenable is Kroll's other argument, that Bolus could not have forged works by Democritus because if he had we would never have known that it was he who was responsible for forging them.<sup>57</sup> In fact Bolus's relationship to Democritus is no different from the relationship of other people whose names have come down to us from antiquity to Orpheus, or to Pythagoras. 58 Behind these specific misunderstandings lie basic issues about the nature, the purpose, and—for want of a better word —the ethics of ancient forgery which we cannot afford to ignore or judge superficially.

III

The Turba philosophorum—'Gathering' or 'Assembly' of the Philosophers—was one of the most influential of all western alchemical texts.<sup>59</sup> It takes the form of

<sup>52</sup> Kroll (as in n. 34), p. 230, followed e.g. by Fraser (as in n. 29), ii, p. 640 n. 532; Hershbell (as in n. 34), p. 7. That Bolus not only used Theophrastus, which is by no means surprising, but also cited him can be inferred from the report about Theophrastus which occurs in Stephanus of Byzantium, Ethnica, s.v. Ἄψυνθος—immediately after the words περὶ οὖ Βῶλος ὁ Δημοκρίτειος. It is true that A. Meineke in his edition of Stephanus (Berlin 1849, p. 153.10) insisted on placing a full stop after this mention of Bolus and denying any connection between it and the following ὅτι Θεόφραστος. But first, this is to miss the implications of the parallel passage in Apollonius (above, n. 30). Second, it is to miss the natural implication of the ὅτι construction in Stephanus which-regardless of whether it is made to begin a new sentence or not-is most plausibly understood as meaning '[And Bolus goes on to say] that' (cf. the parallel passage in Stephanus, s.v. Βέννα, ... ως εφορος. ὅτι Ανδροκλος..., where the Androclus story is almost certainly derived from Ephorus; the other examples of on in Stephanus cited by Letrouit, as in n. 30, throw no light on the matter). And third, Meineke's reason for wanting to segregate the reference to Bolus from the quotation of Theophrastus-that Bolus could not have quoted Theophrastus in his work (Bolus teste Theophrasto uti non potuit: loc. cit.) since he wrote under the pseudonym of Democritus—is, as we are about to see, based on a misunderstanding. On Bolus's use of Theophrastus see E. Oder's valuable comments, 'Beiträge zur Geschichte der Landwirthschaft bei den Griechen', Rheinisches Museum für Philologie, xlv, 1890, p. 75, and compare

the use made of Theophrastus by Pliny: G. E. R. Lloyd, *Science, Folklore and Ideology*, Cambridge 1983, pp. 145f. <sup>53</sup> See above. n. 30.

<sup>54</sup> T. Weidlich, *Die Sympathie in der antiken Litteratur*, Stuttgart 1894, pp. 33f; F. Jacoby, *Die Fragmente der griechischen Historiker*, iiiA (Kommentar), Leiden 1954, p. 25.

<sup>55</sup> Cf. Paradoxographorum Graecorum reliquiae, ed. A. Giannini, Milan 1966, pp. 32.4, 34.28, 36.60 and passim; Giannini (as in n. 30), p. 123.

<sup>56</sup> Cf. e.g. Oder (as in n. 52), p. 72 (Democritus literature); A. Grafton, *Forgers and Critics*, Princeton 1990, pp. 87–9.

<sup>57</sup> Kroll (as in n. 34), p. 230, approved e.g. by Hershbell (as in n. 34), p. 6 and n. 18.

58 For e.g. Zopyrus of Heraclea as a forger of works by Orpheus see Clement of Alexandria, *Stromata* i.21.131.3; *Suda*, s.v. 'Ορφεύς; Kingsley, *Ancient Philosophy* (as in n. 1), chs 11f. For Cleemporus as a forger of works by Pythagoras see H. Thesleff, *An Introduction to the Pythagoran Writings of the Hellenistic Period*, Åbo 1961, pp. 14, 20, 28, 106. On the analogies between pseudo-Democritea and pseudo-Pythagorica see Oder (as in n. 52), p. 74; Jacoby (as in n. 54), p. 24.

<sup>59</sup> Its influence extended far beyond the various Latin Allegoriae and Exercitationes which were written as commentaries on it but then became influential works in their own right (Artis auriferae... volumina duo, Basle 1593, i, pp. 139–45, 154–82; Theatrum chemicum, v, Strasbourg 1622, pp. 64–100). See Berthelot, La chimie (as in n. 36), i, pp. 90, 234, 249–56, 270–3, 286, 294; J. Ruska, Turba philosophorum, Berlin 1931, pp. 318–46; M.-L. von

discussions and debates on alchemical subjects between ancient philosophers who have gathered together for this purpose under the presidency of Pythagoras. <sup>60</sup>

For a long time it has been realised that the work was not originally written in Latin, but is a translation from the Arabic.<sup>61</sup> In fact fragments of an Arabic version still survive, and in one manuscript are described as coming from a work called Mushaf al-jamā'a or Tome of the Gathering. 62 There are two points worth noting about this title. First, here we plainly have the prototype of the word used in the Latin title: turba is a straightforward translation of the Arabic jamā'a which, just like the Latin term, means both a 'gathering' and a 'crowd'. 63 Second, although the Arabic title is invariably translated nowadays as 'Book of the Gathering', this is to risk overlooking the fact that its first word—mushaf—is associated specifically with books produced during the earliest stages of Islamic adoption and adaptation of the codex.<sup>64</sup> As a result, in later centuries the word tended only to be applied either to the first of all Islamic texts, the Koran, or in more esoteric circles to alchemical and magical works where the purpose was clearly to endow the text in question with a special scriptural authority. 65 The fact that book titles including this archaicsounding word were liable to be given alternative, more prosaically explicit names that started with the standard word for a book—kitāb66—is a point we will come back to later.

It is important not to oversimplify the relationship between the *Muṣḥaf al-jamā* and the Latin *Turba philosophorum*. Only some of the Arabic fragments correspond to what we find in the Latin work. Julius Ruska correctly diagnosed the situation in the 1930s, when he pointed to the fact that the Latin *Turba* presents itself as being only a record of the 'third Pythagorean conference' and concluded that our Latin text is just a small survival of a more extensive original work in which more philosophers participated and more speeches and discussions occurred.<sup>67</sup>

Beyond firmly establishing the existence of an Arabic original for the Latin *Turba*, Ruska did little to clarify the circumstances in which the Arabic text arose. He was able to name Egypt as its place of origin; but his attempts at dating the text were unsuccessful. <sup>68</sup> It was left to Martin Plessner to take the matter further. After

Franz, Aurora consurgens, London 1966, pp. 8, 96f, 106–13, 126f; P. Duval, 'La Turba Philosophorum Gallica', Alchimie mystique et traditions populaires (Les Cahiers de Fontenay, xxxiii), ed. J. Bonnamour, Fontenay 1983, pp. 9–67; H. M. E. de Jong, 'The Chymical Wedding in the Tradition of Alchemy', Das Erbe des Christian Rosenkreuz, ed. F. A. Janssen, Amsterdam 1988, pp. 119, 131.

by M. Plessner, Vorsokratische Philosophie und griechische Alchemie, Wiesbaden 1975, pp. 35–88.

61 Cf. e.g. Berthelot and Ruelle (as in n. 36), i, p. 235; M. Steinschneider, *Die europäischen Übersetzungen aus dem Arabischen*, ii, Vienna 1905, pp. 62–72.

62 Ruska (as in n. 59), pp. 18, 297, 300, 313; M. Ullmann, Die Natur- und Geheimwissenschaften im Islam, Leiden 1972, pp. 213f; U. Rudolph, 'Christliche Theologie und Vorsokratische Lehren in der Turba philosophorum', Oriens, xxxii, 1990, p. 114 with n. 28. Compare the Latin text of the Turba, p. 129.19–20 Ruska, where

Pythagoras says that the philosophers present at the gathering have helped in composing 'this book which is called "The Gathering" ('librum qui Turba dicitur').

63 Ruska, op. cit., pp. 9, 16, 18.

<sup>64</sup> J. Pedersen, *The Arabic Book*, Princeton 1984, pp. 101f; R. Sellheim, art. 'Kitāb', *The Encyclopaedia of Islam*, 2nd edn, v, 1986, col. 207a; J. Burton, art. 'Mushaf', ibid., vii, 1993, pp. 668f.

65 Cf. e.g. C. Brockelmann, Geschichte der arabischen Literatur, Supplementband, i, Leiden 1937, p. 519; F. Sezgin, Geschichte des arabischen Schrifttums, Leiden 1967–, iv, p. 383, and vii, p. 462; Ullmann (as in n. 62), p. 431

<sup>66</sup> See Sezgin, op. cit., iv, p. 42 §5, p. 69 §2, p. 75 §1. <sup>67</sup> *Turba*, p. 109.2–3 Ruska ('in tertia synodo Pitagorica'). See Ruska (as in n. 59), pp. 48f, 296f, plus the closing reference—to a fourth as well as third assembly—in the Paris Arabic MS 5099, fol. 259° (ibid., p. 313). See also Rudolph's comments (as in n. 62), pp. 114f, 122.

narrowing the period of composition of the Arabic *Turba* literature down to some time between the late ninth and early tenth centuries, he very plausibly located a reference to it in an alchemical work listed by Ibn al-Nadīm under the title *Book of the Debates of the Learned and their Communications* (*Kitāb munāzarāt al-'ulamā' wa mufāwaḍātihim*). As the author of this work Ibn al-Nadīm names the alchemist 'Uthmān Ibn Suwaid Abū Ḥarī, who was living and working at precisely the time required: either just before or just after the year 900. Ibn Suwaid was from Akhmīm—the Greek Panopolis—in Upper Egypt.<sup>69</sup>

That this Book of the Debates of the Learned and their Communications by Ibn Suwaid was an alternative title for the Mushaf al-jamā'a or Tome of the Gathering is, as Plessner noted, highly probable. In introducing a section from the Arabic Mushaf, the mid-tenth century writer Ibn Umail presents each of its philosophers as contributing in turn to the dialogue 'in his communication with the gathering ... and in a debate' (fi muqāwalatihi ma'a [al-]jamā'at ... fi ba'd murāja'a).70 The term 'the Learned', al-'ulamā', corresponds to expressions that we find repeatedly both in the Latin Turba text and in the Arabic Muṣḥaf.71 And we can also add the point noted earlier: that book titles starting with the archaic-sounding word muṣḥaf were especially liable to be given alternative, more explicit and modern-sounding names that began with the more prosaic word kitāb.

There is one other piece of evidence which also deserves to be mentioned: a passage in the corpus of alchemical texts ascribed to Jābir ibn Ḥayyān. The passage in question contains a fleeting reference to how the most famous ancient philosophers—including Pythagoras—'all gathered together ... to have a debate' ( $kulluhum\ ijtama^c\bar{u}\ ...\ fa\ tanāzaru\ munāzara$ ), followed by the statement: 'I have

68 Ruska (as in n. 59), pp. 318–20; cf. idem, *Tabula smaragdina*, Heidelberg 1926, pp. 48–58. Ruska tended to try dating the text much too late, and his hypothesis that it was dependent on other—more easily datable—Arab alchemical texts has subsequently had to be reversed. See M. Plessner, 'The Place of the *Turba Philosophorum* in the Development of Alchemy', *Isis*, xlv, 1954, p. 332; idem (as in n. 60), pp. 125–7; Ullmann (as in n. 62), p. 214.

(as in n. 62), p. 214.

69 Ibn al-Nadīm, *Kitāb al-Fihrist*, ed. G. Flügel, Leipzig 1871, p. 359.1-6 (tr. B. Dodge, The Fihrist of al-Nadīm, New York 1970, ii, p. 865). See Plessner (as in n. 68), pp. 333f; idem (as in n. 60), pp. 129-32; E. J. Holmyard, Alchemy, Harmondsworth 1957, p. 81; Needham (as in n. 29), v.4, p. 399; and for Plessner's dating of the Arabic Turba, H. Daiber, 'Democritus in Arabic and Syriac Tradition', Proceedings of the First International Congress on Democritus, Xanthi 1984, ii, p. 260. Among other points Plessner drew attention to the fact that the Latin Turba alludes to the Hindu myth of the poisonmaiden-which seems only just to have been introduced into the Arab world by the turn of the 9th/10th century-and noted that according to the Fihrist Ibn Suwaid engaged in prolonged correspondence with Ibn Waḥšīya, who is the first known Arabic-speaking author to have mentioned the myth. Rudolph's scepticism (as in n. 62, p. 99) about Plessner's proposed linking of Ibn Suwaid with the Arabic Turba material is hypercritical, and simply a part of his systematic attempt to undermine Plessner's real achievements (while, incidentally,

perpetuating many of Plessner's smaller errors). See Kingsley, *Ancient Philosophy* (as in n. 1), ch. 5. Similarly hypercritical is the review of Plessner's book by M. Ullmann in *Mundus*, xii, 1976, pp. 288f, which fails to come to grips with the issues involved: for Ullmann's comments on the myth of the poison-maiden see his own retraction in Rudolph, loc. cit., and also contrast his remarks elsewhere on Ibn Suwaid's work as 'reminiscent' of the *Muṣḥaf al-jamā'a* (Ullmann, as in n. 62, p. 217).

p. 217).

70 Ruska (as in n. 59), pp. 313f; Plessner (as in n. 60), p. 130.

p. 130.

71 Compare e.g. the routine instruction to the assembled philosophers in both the Arabic and Latin Turba texts to 'learn, you gathering of seekers of this learning' (i'lamū yā ma'šar ṭalabat hādha 'l-'ilm: Ruska, as in n. 59, pp. 16, 122.2, 132.3, 138.18, 308); the Arabic references to the participants as 'wise men belonging to the gathering of Pythagoras' (al-hukamā' min jamā'at Fītāgūras: Abu 'I-Qāsim al-Irāqī, Kitāb al-Ilm..., ed. E. J. Holmyard, Paris 1923, pp. 32.10 and 33.7 of the Arabic text; cf. Ruska, op. cit., p. 16); and also the Latin Turba's standard description of the assembly as a 'gathering of the wise' (turba sapientum: ibid., pp. 123.13, 135.23). In the language of the *Turba* itself, 'learning' and 'wisdom' -scientia and sapientia, 'ilm and hikma—are interchangeable. See ibid., pp. 120.14, 122.2-3, 132.3; A. M. Goichon, art. 'Hikma', The Encyclopaedia of Islam, 2nd edn, iii, 1971, p. 378; and the art. 'Ilm', ibid., col. 1133b.

devoted a book to the debate of the philosophers' (wa qad afadtu li-munāzarat alfalāsifa kitāban). 72 The mention of the philosophers 'gathering together' (ijtama  $\bar{u}$ ) of course echoes the jamā'a and turba of our Arabic and Latin titles; and the idea of an alchemical gathering of ancient philosophers, including Pythagoras, plainly matches the format of the Mushaf al-jamā'a as a whole. On the other hand, the mention of a 'book' (kitāb) specifically devoted to 'the debate of the philosophers' (munāzarat al-falāsifa) is unmistakably reminiscent of the title 'Book of the Debates of the Learned' (kitāb munāzarāt al-'ulamā') given by Ibn al-Nadīm: in Arabic the two terms 'philosophers' and 'learned'—falāsifa and 'ulamā'—were virtually synonymous outside of orthodox circles, and both were equally valid translations of the Greek philosophoi. As for the use of the word 'ulama' in the title mentioned by Ibn al-Nadīm, it was no doubt dictated by conscious or unconscious imitation of the standard Islamic phrase for interchanges of opinion between scholars (mufāwadāt al- $^{c}ulam\bar{a}^{\circ}).^{73}$ 

While this passage in 'Jābir' provides an additional link between the Turba literature and the book title ascribed to Ibn Suwaid by Ibn al-Nadīm, it also suggests that Ibn Suwaid was not the only person to write about alchemical conferences of ancient philosophers. In doing so it suggests, as well, why Ibn Suwaid should have come to be known as a disciple (tilmid) of Jabir. 74 That is not to say that this relationship of teacher and disciple is to be taken literally. On the contrary, the evidence tends to indicate that so-called 'disciples' of Jabir ibn Hayyan were the original authors of works which later were re-assigned to Jabir himself so that they could be included in the corpus of his works. 75 Here we have to consider among other factors the Ismā îlī colouring of parts of this Jābir corpus, and the well-known tendency of Ismā îlīs to include earlier representatives of Islamic science and wisdom among their number-even at the cost of rewriting the past and turning history on its head.<sup>76</sup> Jābir's book 'devoted to the debate of the philosophers' may have been a separate work from Ibn Suwaid's, but there is no reason to suppose that

Even if there was no work by Jabir to provide a precedent for Ibn Suwaid, we are still faced with the broader issue of the background to the Mushaf al-jamā'a. As a whole, there can be no doubt that it was a uniquely Arab creation: parts of it are only understandable in the context of Islamic religion and culture.<sup>77</sup> But at the

<sup>72</sup> Kitāb al-mujarradāt, in P. Kraus, Jābir ibn Ḥayyān, Cairo 1942-3, ii, p. 59 n. 1.

<sup>73</sup> E. W. Lane, An Arabic-English Lexicon, vi, London 1877, p. 2459, col. 1.

<sup>&</sup>lt;sup>74</sup> Ibn al-Nadīm, Fihrist, p. 355.22-3 Flügel (as in n. 69), where al-Ilmīmī is evidently a reference to Ibn Suwaid: cf. ibid., p. 359.1 with Flügel ad loc.; Kraus (as in n. 72), i, pp. lxii-lxiii.

To Ibid., i, pp. lxii–lxv, esp. p. lxii with n. 10.
 See e.g. H. Corbin, Cyclical Time and Ismaili Gnosis, London 1983, p. 136 with n. 198, on the Ismā'īlī 'appropriation' of Qustā ibn Lūgā; the Ismā ilī adoption of material from the so-called pseudo-Ammonius doxography (K. E. Rowson, A Muslim Philosopher on the Soul and its Fate, New Haven 1988, pp. 46f; U. Rudolph, Die Doxographie des Pseudo-Ammonios, Stuttgart 1989, pp. 13, 23-5, 117f, 130, 137); and Kraus's comments (as in n.

<sup>72),</sup> i, p. xlix. Note also the use made in the Jābir corpus of the hadith about the sun rising in the West, so as to justify the founding of the Fatimid dynasty in Egypt by the Ismā īlīs during the early 10th century (ibid., i, p. 1): for the general practice of fabricating hadiths of this type cf. I. Goldziher, Études sur la tradition islamique, Paris 1952, pp. 108-57; C. Addas, Quest for the Red Sulphur, Cambridge 1993, pp. 11f. On the relation between Fāţimid Egypt and Persia in the development of Ismā'īlī doctrine note F. Zimmermann's query, 'The Origins of the So-called *Theology of Aristotle*', *Pseudo-Aristotle in the* Middle Ages, ed. J. Kraye et al., London 1986, p. 237 n.

<sup>77</sup> Plessner (as in n. 60), pp. 84, 124f, 129, 133; Rudolph (as in n. 62), pp. 99, 106f, 109f; and e.g. above, n. 69. Both Sezgin (as in n. 65, iv, pp. 62-5) and

same time many of its terms and ideas, and sometimes even entire passages, can be traced back to Greek literature. Regarding the title of the work, and the form in which the text is cast—a gathering of and discussion between alchemists, or 'philosophers' as they used to call themselves — the very fragmentary remains still survive of a Greek alchemical work called, precisely, 'Gathering of the Philosophers' (Περὶ συνάξεως τῶν φιλοσόφων). Here, clearly, we have the Greek prototype both of the Latin title  $Turba\ philosophorum$  and of its Arabic equivalent. Although this line of affiliation has long been recognised, the tendency has been to restrict the connection to the name of the works alone and deny any similarity of content. However, the parallels in fact go much further than that.

And yet behind these similarities of form and content lies something much more fundamental. Underneath the accretions of Islamic, alchemical and also Gnostic ideas, genuine teachings of the Presocratic philosophers are preserved at the very core of the *Turba* tradition. Elsewhere I have outlined the route followed by these Presocratic teachings before they surfaced at Akhmīm in Upper Egypt during the tenth century AD; the subsequent course of transmission as they penetrated eastwards as far as Iran; and—last but not least—the significance of the way that teachings which originally owed so much to the East eventually returned to the East.<sup>82</sup>

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Ullmann (*Mundus*, xii, 1976, pp. 288f) minimise the significance of the evidence and, in hypothesising that the *Muṣḥaf* is simply a translation from the Greek, fail to appreciate that such supposed 'translations' often either involved extensive reworking and elaboration of the original Greek or were not in any real sense of the word translations at all. Cf. e.g. Kingsley, 'The Christian Aristotle: Theological Interpretation and Interpolation in Medieval Versions of *On the Heavens'*, *Le Muséon*, cvii, 1994, pp. 195–205; Zimmermann (as in n. 76), pp. 110–240; and for a trenchant criticism of the position adopted by Sezgin in particular see Plessner, 'The History of Arabic Literature', *Ambix*, xix, 1972, pp. 210–13, 215

<sup>78</sup> See already Berthelot, *La chimie* (as in n. 36), i, pp. 258–66; and note in particular correspondences with Greek alchemical writings by Zosimus of Panopolis and Olympiodorus of Alexandria of the type pointed out by Ruska (as in n. 59), p. 183 n. 1.

<sup>79</sup> P. Tannery, Mémoires scientifiques, vii, Toulouse 1925, p. 123; Plessner (as in n. 60), p. 16; H. Corbin and M. Mo'in, Nasir-e Khosraw, Kitāb jāmi al-hikmatain, Tehran and Paris 1953, pp. 54f; P. Lory in H. Corbin, Alchimie comme art hiératique, Paris 1986, p. 56 n. 3.

80 Greek text in Berthelot and Ruelle (as in n. 36), ii, pp. 35.17–36.18. For Latin *turba* and Arabic *jamā* as

translations of the Greek σύναξις or συναγωγή (ibid., p. 35.17 and 19) see E. O. von Lippmann, *Entstehung und Ausbreitung der Alchemie*, i, Berlin 1919, p. 483 n. 3; Plessner (as in n. 60), p. 19 n. 45.

81 For the minimalist explanation see e.g. M. Berthelot, Les origines de l'alchimie, Paris 1885, pp. 119, 143; Plessner (as in n. 60), p. 9 and n. 15. For parallels in content compare Berthelot and Ruelle (as in n. 36), ii, p. 36.9–10, 11–12 and 13–18 with, respectively, Turba, pp. 124.23–4, 141.21–3 and 125.1–24 Ruska. (Berthelot's dismissal of ii, p. 36.11–12 as a late 'interpolation'—see Berthelot and Ruelle, iii, p. 37 n. 6—is totally unjustified, and stems from his failure to appreciate the fragmentary nature of the surviving Greek text.) It is also worth noting that, on Berthelot's own admission (ibid., iii, p. 37 n. 4), there is evidence of a continuous tradition of theme and motif extending from the Greek text right through to the late Latin commentaries on the Turba.

<sup>82</sup> Ancient Philosophy (as in n. 1), chs 5, 15–24. My thanks to all who have helped in various ways in connection with this paper, and especially to John Boardman, Charles Burnett and Sara Sviri.



New Light on the Function of "Borrowed Notes" in Ancient Greek Music: A Look at Islamic

Parallels

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# New Light on the Function of "Borrowed Notes" in Ancient Greek Music:

# A Look at Islamic Parallels

NANCY SULTAN

n several of the fragments of ancient Greek music, a note that does not seem to belong to the established tonos for that piece appears in an unexpected and hitherto unexplained place in a melodic line.1 The occurrence of these as "borrowed notes" has been hypothesized, if not thoroughly investigated, by those who study the ancient fragments.2 The exact relationship between the tonos of the piece in which the odd note appears and the tonos to which the odd note belongs has yet to be determined, and the reason for the odd note's very existence and its intervallic relationships with the notes surrounding it have remained a perplexing problem. One approach to understanding these "borrowed notes" might be through Persian and Turkish music.<sup>3</sup> Turkish music has much in common with Persian music, including the same modal system,4 and both Persian and

<sup>1</sup> This article develops part of the content of a paper read at the 1984 meeting of the Classical Association of the Middle West and South. I would like to thank Professors Jon Solomon and Thomas Mathiesen for their support and helpful suggestions, and Professor Gregory Nagy for his insights during my participation in the 1985 NEH Summer Seminar for College Teachers at Harvard University.

<sup>&</sup>lt;sup>2</sup> E.g. by S. Eitrem, L. Amundsen, and R. P. Winnington-Ingram, Fragments of Un-

<sup>known Greek Tragic Texts (Osloae, 1955), 46n.
In this paper all uses of the words "Turkish music" will refer specifically to Turkish</sup> art music, of which the earliest historical evidence comes from the thirteenth century. Since the earliest historical evidence of Greek music comes from the fifth century B.C., there is an obvious gap in time which cannot be avoided. Modern Turkish art music as presented by K. L. Signell in Makam: Modal Practice in Turkish Art Music (Washington: Asian Music Publications, 1977) is based primarily on the works of three theorists who were profoundly influenced by the nationalism of the Ottoman Empire—Yekta, Ezgi, and Arel. The "Turkishness" of their work is evident, but the Arabic lineage and historical background of Turkish music is well presented by Signell.

<sup>&</sup>lt;sup>4</sup> For the common Arab and Persian system, see O. Wright, The Modal System of Arab and Persian Music A.D. 1250-1300 (Oxford, 1978), 3-8.

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Turkish music show significant borrowings from the system of the ancient Greeks. At least four similarities can be immediately observed:

1) both ancient Greek and Islamic (Persian and Turkish) music are monophonic with some heterophony, 2) both are organized on the tetrachord system, 5 3) both contain "pure" or "simple" melodies, or melodies without modulation and melodies with modulation, 6 and 4) both are based on texts. 7

While the first specific mention of Arabo-Greek translations of Aristotle, Aristoxenus, Euclid, Ptolemy, and others occurs in the writings of tenth-century authors, there were Arabic translations of Greek theorists available from the mid-ninth century.8 In the treatises of al-Kindi (d.c. 874) and al-Farabi (d. 950), two of the most influential Islamic music theorists, references can be found to the theories of the "Ancients." Al-Kindi wrote: "as to how the Ancients named them [the notes] and how we follow them worthily, and the reasons for that, then we have already explained this." Al-Farabi, in the introduction of his Kitab al musiqi al Kabir (Grand Book on Music), stated, "the principles which the Ancients framed and employed in their books gave explanation of the art to us, for it is from the Ancients and not the Moderns that we take directions."10 Among the theoretical and ideological principles adopted from the ancient Greeks with or without modification by Islamic theoreticians are: 1) musical notation, 11 2) rhythm, 3) the idea of music as a science, 4) mathematical/practical applications, 5) Platonic

<sup>5</sup> E. Zonis, Classical Persian Music: An Introduction (Cambridge, 1973), 30.

- <sup>7</sup> Zonis, 128; Signell, 8of.
- 8 H. G. Farmer, Historical Facts for the Arabian Musical Influence (London, 1929), 274.
- 9 Al-Kindi, "British Museum MS" 2361, fol. 165v. Translation in Farmer, 63.
- <sup>10</sup> Al-Farabi, "Leyden MS" 1423, fol. 2. See also Baron R. Erlanger, La Musique Arabe, vols. 1–2 (Paris, 1930), 1.
- Alphabetic systems for the notation of music existed in Islamic countries at least as early as the ninth century, but were seldom used, because most teaching was done by rote (see Zonis, 27). K. L. Signell refers to the use of "cipher notational systems" from the thirteenth century in the Muslim world, adding that these were probably used only to "illustrate a theoretical point or to collect known pieces" (Signell, 2). Greek notations are set out by Alypius who, in his *Isagōgē Mousikē* (3rd or 4th century A.D.) gives a set of tonos scales with reproductions and verbal descriptions of the corresponding symbols in two notations. The notation contains fifteen symbols, many of which are alphabetic but not in alphabetical order, and the rest are inverted letters and non-alphabetic signs. The first

<sup>&</sup>lt;sup>6</sup> A fifth similarity proposed by Zonis (p. 30) is that both Arabic/Persian and Greek music are improvised using melody types (makam/dastgah and nomos). There is, however, no written evidence proving that improvisation was a Greek practice (although it is also an unwritten phenomenon in Arabic music); the word nomos may refer to a style of composition with heavy modulation corresponding to Turkish ara or geçki taksimi, which are improvised forms. See Signell, 114. For a description of nomos as a melody type, see R. P. Winnington-Ingram, "Greek Music, Ancient I," in the New Grove Dictionary of Music and Musicians VII, 661 (hereafter, Grove). For nomos as a solo piece see A. Barker, Greek Musical Writings, vol. 1 (Cambridge, 1984), 249–55.

doctrines of "ethos," and 6) certain instruments (*luth/ūd*, *barbat*).<sup>12</sup> The synthesis of ancient Greek and Arabic (including Persian) music can easily be seen by comparing the treatises of Aristoxenus and Aristides Quintilianus with those of Safiyu-D-Din, al-Farabi, and al-Kindi, <sup>13</sup> in which many parallels can be drawn between the use of melody, rhythm, and text-music relationships. In sum, to the Greeks, music theory was one part of a larger scientific/philosophical construct, and it was borrowed and adapted into the Islamic scientific/philosophical construct as part of the whole.

Before delving into the comparison between Arabic and ancient Greek use of "borrowed notes," the problem of terminology must be discussed in order to establish a clear definition of the modal systems in which the borrowed notes function. Turkish makam and Persian gusheh can be defined as "modal systems": a set of compositional rules by which the melodic component of a piece of music is realized. <sup>14</sup> There are thirteen "basic" makam-s, and altogether sixty to seventy, each with its own name and own distinctive structure. <sup>15</sup> The Persian gusheh-ha are a special repertory of melodies used as genetic materials for the creation of new pieces. <sup>16</sup> They provide "the modal and rhythmic features of the melody, its shape, and other features of mood and character that may be the sum of the above plus other, indefinable ingredients. . . . "<sup>17</sup> Similar in many ways to the makam and gusheh is the Greek tonos. There have been many attempts in recent times to find a suitable definition of

notation is called "vocal," the second, "instrumental." Like the early Islamic notation, Alypius' tables were primarily used as a mere numerical cipher for tonoi of no real pitch-value. See the discussion of notation in Isobel Henderson's "Ancient Greek Music," in Ancient and Oriental Music, ed. Egon Wellesz (London, 1957), 358ff (New Oxford History of Music 1).

<sup>&</sup>lt;sup>12</sup> Erlanger, 258ff. The doctrines of Plato, Aristotle, Pythagoras, Aristoxenus, the Neo-Platonists, and Ptolemy all contributed to the development of Arab music theory, though reconciliation with certain indigenous Arab or Persian features was effected. See Wright, 12, 21.

<sup>&</sup>lt;sup>13</sup> See the comparison chart in E. Werner, "Greek Ideas on Music in Judeo-Arabic Literature," in *The Commonwealth of Music*, ed. G. Reese and R. Brandel (New York, 1965), 72. For Arab texts and translations, see H. G. Farmer, "Musiki," *Encyclopaedia of Islam* (Leiden, 1913–38). For a complete listing of Arab texts, translations, and other references, see A. Shiloah, ed. "The Theory of Music in Arabic Writings (900–1900)," in *Répertoire International des Sources Musicales* BX (Munich, Duisberg. 1979).

<sup>&</sup>lt;sup>14</sup> Signell, 16. It is important to note that the modern Western interpretation of the word "mode" cannot be used here. "Modal framework" or "system" would be better terms, for *makam*, *gusheh*, and *tonos* prescribe not only a scale with a given ambitus and center tone—as does a mode—but also typical motifs and tone progressions. See the definition of melody types in Willi Apel, *Harvard Dictionary of Music*, rev. ed. (Cambridge, MA, 1969), and Don Randel, *The New Harvard Dictionary* (Cambridge, MA, 1986).

<sup>15</sup> Signell, 16.

<sup>&</sup>lt;sup>16</sup> Zonis, 45–46.

<sup>&</sup>lt;sup>17</sup> Ibid.

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tonos and other musical terms (i.e. "octave species" and "harmonia"), 18 but as yet no one has looked at Islamic parallels for possible answers. The ancient Greek theorists were confusing in their discussions of terminology, but an ethnomusicological look at the similarities between makam, gusheh, and tonos may provide some new insight. Tonos (sometimes tropos) has been frequently defined as a "transposition scale." At the time of Aristoxenus there were thirteen such tonoi, and two more were added later. They held the ethnic names commonly associated today with modes—Dorian, Lydian, Phrygian, and the like—but, like the makam-s and gusheh-ha, tonoi are more like "modal systems."

The number of similarities between *makam-s*, *gusheh-ha*, and *tonoi* is striking: 1) each has its own distinct structure and its own name, 2) some *tonoi* have "tribal" names, and titles for the *gusheh-ha* are sometimes taken from "towns, villages, or tribes," 21 3) each is based on a series of tetrachords (and in Arabic, pentachords), 4) each contains "fixed" and "variable" notes, 5) within the tetrachord system, each pitch making up a *makam/tonos* has its own name indicating its intervallic relationship with its neighbor, 6) there are thirteen "basic" *makam-s*, and there were thirteen *tonoi* at the time of Aristoxenus, 7) each has tonal centers, 8) modulation can occur between *makam-s*, *gusheh-ha*, and *tonoi*. 22 The three systems are not exactly alike in that Arabic theorists

<sup>&</sup>lt;sup>18</sup> The most recent set of discussions are by C. V. Palisca, A. Barbera, J. Solomon, C. M. Bower, and T. J. Mathiesen, "The Ancient Harmoniai, Tonoi, and Octave Species in Theory and Practice," *The Journal of Musicology* III/3 (1984). Although more questions are posed than answered, these five articles are among the noblest attempts to explain the theoretical and practical problems of terminology. The word *tonoi* will be used in this paper to refer to the fifteen "transposition scales" presented by Alypius. Five are low (hypo-) five are high (hyper-) and five have non-compounded ethnic names. See "Alypi Isagoge," *Musici scriptores graeci* (Leipzig, 1895. Reprint, Hildesheim, 1962), 359–406. References to Cleonides and Bacchius are also taken from this edition.

<sup>&</sup>lt;sup>19</sup> J. F. Mountford and R. P. Winnington-Ingram, "Music," in the Oxford Classical Dictionary, Second Edition (Oxford, 1970. Reprint 1978), 708 (hereafter, OCD²); Grove, 665. It is misleading to refer to tonos as a "transposition scale," because that definition limits the functions tonoi might serve in a piece. For example, a tonos may, in some cases, be "transposed," like the set (transposed) category of makam. Here, "transposition" refers to an "identity or similarity of intervallic structure between two abstract scales," formed by moving a makam from its original place (i.e. up or down a fourth, etc. See Signell, 134). If tonoi provide a relative pitch register and a tonal sequence, then there may well be "transposed" types of tonos. As with the makam, however, each tonos (whether it was "transposed" or not) would have a distinct and separate quality; other criteria need to be considered in identifying a tonos, including what Signell (p. 137) calls "melodic direction, characteristic modulations, and . . . tessitura."

<sup>&</sup>lt;sup>20</sup> J. Solomon, "Towards a History of Tonoi," *The Journal of Musicology* III/3 (1984), 249: The tribal *harmoniai* become the *tonoi*.

<sup>&</sup>lt;sup>21</sup> Zonis, 51.

Signell, 114. For ancient Greek discussions of modulation, see Cleonides, 204f (cf. note 18 above); Bacchius, 304; Aristoxenus, *Harmonics*, ed. H. S. Macran (Oxford, 1902), 2.38; Aristides Quintilianus, *De musica libri III*, ed. R. P. Winnington-Ingram (Leipzig, 1963), 22–23. For the English translation, notes, commentary, and annotations, see Aristides Quintilianus, *On Music in Three Books*, trans. T. J. Mathiesen (New Haven, 1983).

modified the theory they learned from the Greeks and were influenced by other writers as well.<sup>23</sup> Still, a comparison of the two is easily made with regard to many theoretical if not practical phenomena.

Concerning the problem of "borrowed notes" specifically, many similarities can be seen in the way the Greeks and the Turks use them; a comparison between ancient Greek and the better preserved, better documented Islamic theory may shed light on the problem of "borrowed notes" in Greek music. In Turkish music, a note is very often introduced from another makam for a variety of reasons: "single note borrowing"24 is a chromatic alteration that does not cancel out the established tonality, but may 1) simply supply color and decor, serving no specific function, 2) create a distinction or connection between *makam-s*, or serve as a pivot for modulation.25 In Turkish music, modulation occurs regularly "according to strict, if unwritten rules." 26 One note, a phrase, or an entire passage of note borrowing can indicate modulation, which is usually brief, and occurs most frequently in the "B" section of the ternary ABA or ballade AABB forms.<sup>27</sup> Ancient Greek metabole was explained by theorists such as Cleonides and Bacchius as being a modulation either between conjunct and disjunct tetrachords or diatonic and chromatic genera,28 but the "borrowed notes" were never accounted for. Cleonides wrote that every modulation requires the presence of some element, and that element may be a single note;<sup>29</sup> he did not, however, describe any further function a single note might serve in a tonos other than its own. The occurrence of "borrowed notes" in the Berlin Papyrus, Mesomedes Hymns One and Two, First Delphic Hymn, Oslo Papyrus, and others<sup>30</sup> may be shown to function in a way similar to those in Turkish music.

<sup>&</sup>lt;sup>23</sup> For Greek and other influences on Islamic thought, see M. Fakhry, A History of Islamic Philosophy (New York, 1983), 1–36.

<sup>&</sup>lt;sup>24</sup> Signell, 68f. The term "single note borrowing" is his own.

<sup>&</sup>lt;sup>25</sup> Ibid., 84. i.e. to another *makam*, sometimes having the same tonal center.

<sup>&</sup>lt;sup>26</sup> Ibid., 66. it is important to stress "unwritten" rules as being as strict and important to follow as written ones. In Arabic, and in all likelihood in ancient Greek music, there are many unwritten modes of practice which, although difficult to assess theoretically, should not be considered immaterial. The lack of written treatises explaining "single note borrowing" need not prove that it was rare, occurring only in folk music.

<sup>&</sup>lt;sup>27</sup> Signell, 68. The exact form of the extant pieces of Greek music has not been established. Several fragments (especially Mesomedes Hymns One and Two, the Delphic Hymns, and the Berlin Papyrus) seem to show a free style abc. . . form with no repeated sections, not completely unlike a melodic sequence. The ballade form AABB which was so popular in Persian music does not appear to have any parallels in ancient Greek relics.

<sup>&</sup>lt;sup>28</sup> Cleonides, 294; Bacchius, 304. See also R. P. Winnington-Ingram, Mode in Ancient Greek Music (Cambridge, 1936), 53.

<sup>29</sup> Ibid.

<sup>&</sup>lt;sup>30</sup> Collected in E. Pöhlmann, *Denkmäler altgriechischer Musik* (Nürnberg, 1970). The Pöhlmann numbers of the pieces listed on page 4 are, in order: Berlin Papyrus, #32; Mesomedes Hymns One and Two, #1-2; First Delphic Hymn, #19; Oslo Papyrus, #36. This list is by no means all inclusive. The Second Delphic Hymn (Pöhlmann #20 and the Epidauros Inscription (APXAIOΛΟΓΙΚΗ ΕΦΕΜΕΡΙΞ, Markellos Th. Mitsos, 1980) also

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First, the "borrowed notes" never occur at the very beginning or end of a piece, but in the middle, which would be equivalent to the B section of a Turkish ternary piece. In the Greek fragments at least one line is given to establish the *tonos* before an intrusive note appears.<sup>31</sup> Borrowed notes occur in the following sections: Berlin Papyrus: note E (f) lines 17–19, four times; Mesomedes Hymns One and Two (these may be two sections of the same piece)<sup>32</sup>: note N (d-flat/c‡) lines 3–6, four times; First Delphic Hymn: note O (b) lines 10–16, line 23, eleven times; Oslo Papyrus: note Λ (d-flat/c‡) lines 6, 7, 11, seven times.

Second, the repeated note  $\Lambda$  (d-flat/c#) over the words *phásgana katà* (sword down [over the earth]) in line six of the Oslo Papyrus and the note N (d-flat/c#) over  $ap'alse\bar{o}n$  (from the sacred grove) in line eight of Mesomedes Hymn One may exemplify the use of single note modulation in phrases, as might the occurrence of O in the repeated phrase  $\Lambda$ MO in the middle section of the First Delphic Hymn.

Third, the function of "single note borrowing" as described above can be seen in several relics. The possibility that these "borrowed notes" are purely decorative and serve no function always exists, but Turkish music supplies us with a more basic and theoretically justified conception of their use, namely that the "borrowed notes" support the tonal center in the piece in which they occur by being one-half step above or below the tonic.<sup>33</sup> In the Berlin Papyrus, the *tonos* is Hyperaeolian,<sup>34</sup> mese is note A (f#), and the borrowed note is E (f). this places E one-half step below mese. In Mesomedes Hymns One and Two, the *tonos* is Lydian, mese is M (c), and the borrowed note is O (b), again one-half step below. In these relics the borrowed note is made an upper or lower neighbor of mese, supporting it as in Turkish practice. Moreover, the borrowed note can appear as a neighbor to either paranete hyperbolaion

appear to use borrowed notes, but because of the state of the preservation these problematic texts will not be fully discussed in this paper.

<sup>&</sup>lt;sup>31</sup> Because of the poorly preserved state of most of the relics, it is impossible to guess the total amount of times or places a borrowed note appears in any one piece. For example, in the First Delphic Hymn, the single occurrence of note O (b) on line 23 does not necessarily mean that it actually occurs only once in that section. Much of what comes before and after is indecipherable owing to the fragmentary condition of the stone on which it was inscribed.

<sup>&</sup>lt;sup>32</sup> See the discussion in Pöhlmann, 64–76. The Mesomedes Hymns are problematic because they are only attested (in terms of musical notation) in late manuscript sources. The authenticity of the relic has therefore been questioned.

<sup>&</sup>lt;sup>33</sup> Signell, 69. In most makam-s the dominant can be emphasized by raising either the upper or lower neighbor a half step. For example, in makam Hicazkar the borrowed note Nim Hicaz (d-flat) is often placed next to the dominant (c) for support and color (Signell, 30). The mese in ancient Greek scales is the "middlemost" note, or "dominant," though it sometimes has the function of a "tonic" as well. It connects the two tetrachords hypaton and synemmenon.

Each fragment of Greek music has an assigned *tonos* according to how accurately the type of notation used matches with the *tonoi* organization in the Alypian tables.

(fourth from *mese*) or *nete hyperbolaion* (fifth from *mese*) for added support: In the Berlin Papyrus, the borrowed note E (f) occurs on line 19 after the note K (c $\sharp$ ), a fifth above *mese*. In Mesomedes Hymn Two, the borrowed note N (d-flat/c $\sharp$ ) occurs on line six after  $\Phi$  (g), a fourth from *mese*, and on the same line before C (a), a fifth from *mese*. In the First Delphic Hymn, the borrowed note O (b) occurs on lines 11, 16, and 23 before  $\Phi$  (g) and T (e), a fifth and fourth, respectively, from *mese*. And, in the Oslo Papyrus, the borrowed note  $\Lambda$  (d-flat/c $\sharp$ ) occurs on line six before T (e), a fourth from *mese*, and on line seven it outlines *mese* by being placed between it ascending and descending. From these examples it seems clear that the placement of borrowed notes within a melodic line is a conscious and deliberate act on the part of the composer.

Yet another strong parallel with Turkish music lies in the fact that when the borrowed note does not stand next to mese or a fourth or fifth from mese of the established tonos for that piece, it instead often stands next to a note that is either mese, a fourth or fifth from mese, or the "leading tone" to mese in the tonos to which the borrowed note belongs. Moreover, the borrowed note can be seen as mese itself in its own tonos. In this way, the borrowed note creates either a distinction or a connection between the tonos in which it appears and the tonos to which it more properly belongs; the same occurs in "single note borrowing" between makam-s.35 In the Berlin Papyrus, the tonos is Hyperaeolian, and the borrowed note E (f) belongs to the Lydian, Hypolydian, and Hyperiastian toni. It appears in the piece as either an upper or lower neighbor to the note I (d),36 which is mese in the Lydian tonos, a fourth from mese in the Hypolydian tonos, and the "leading tone" to mese (lichanos meson) in the Hyperiastian tonos. In Mesomedes Hymn One, which is in the Lydian tonos, the borrowed note N (c#) belongs to the Hypolydian, Iastian, and Hyperiastian tonoi.<sup>37</sup> It appears in the piece after Z (e) three times, which in the three tonoi respectively stands a fifth from mese, a fourth from mese, and as mese itself. Similarly, in the First Delphic Hymn, the tonos is Phrygian and the borrowed note O (b) appears as a lower neighbor to K (d), which can be found in four of the nine tonoi containing O

<sup>&</sup>lt;sup>35</sup> Signell, 77. "Single note borrowing" occurs in both the exposition and middle sections. Passing phrases of recognizable tetrachords from other *makam-s* are commonly introduced as well, sometime having the same tonal center as the given *makam* but sometimes temporarily cancelling out the original centers. Similarly, in Persian music, a modulation can be effected by a few notes with only *one* indicating the change. See Wright, 262.

The occurrence of the note E after I in line 19 is hypothetical because the papyrus is illegible at this point.

<sup>&</sup>lt;sup>37</sup> It should be pointed out that in all three of these *tonoi* the note equals d-flat/c#, but in three other *tonoi*, namely the Hypoaeolian, Dorian, and Hyperdorian the note equals c-natural. Despite this discrepancy, there is no reason not to regard the note here as d-flat/c# as does the consensus of modern scholarship.

(b):38 It is mese in the Aeolian, a fifth from mese in the Hyperaeolian, a fifth from mese in the Hypoiastian, and a fifth from mese in the Iastian, where the borrowed note O is itself mese. In these instances the borrowed note serves either to support the centers of the tonos to which it is foreign, or to emphasize the centers of the tonos to which it belongs—in effect, creating a connection or distinction between tonoi and facilitating a brief or potential modulation.

Cleonides states that "a modulation is melodious or unmelodious according to whether the notes that coincide in pitch are similar or dissimilar regarding their participation in the pycnum."39 According to the Aristoxenian system, a modulation is the most harmonious when the two "scales" involved are separated by a fourth or a fifth, and when they are separated by a tone or five tones, modulation is again melodious, though in an inferior degree. 40 In Mesomedes Hymn Two, the borrowed note N (d-flat/c#) may serve to facilitate a modulation from the Lydian in which mese is I (d) to the Hypolydian in which mese is C (a) on the words mouson prokathagéti (leader of the [delightful] muses), line six (melodic progression NCCCCCT or c\( \psi \)-a-a-a-a-a-e); since the two tonoi are separated by a fifth, this brief modulation would be melodious in the highest degree. Similarly, as stated above, in the First Delphic Hymn the borrowed note  $\Lambda$  (d-flat/c#) occurring in the repeated phrase ΛMO (d-flat-c-c-flat—OMΛ also occurs) may indicate a modulation, though not as melodious as in Mesomedes Two. The phrase occurs six times, on the words pheróploio (bearing arms), line 10; taoúrōn (bull), line 12; anakidnatai (spread upwards [toward Olympus]), line 13; ligù dé lōtoòs brémōn, (ringing of the sweet flute), line 14; ōàdaàn krékei (play the song), line 15; anamélpetai (praise in song), line 16. The tonos of the First Delphic Hymn is Phrygian, and in the Dorian tonos, which is a tone away, the  $\Lambda$ MO-OM $\Lambda$  progression supports M (c), one of its tonal centers; since the Dorian and Phyrgian tonoi are separated by a tone, according to the Aristoxenian system, a modulation—though less melodious—could be occurring.41

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<sup>&</sup>lt;sup>38</sup> The note Y (a-flat) never appears in the same tonos as O (b), and although the two occur together many times in the First Delphic Hymn, on these occasions the borrowed note is also next to mese M (c) most likely acting to support this tonal center.

<sup>39</sup> Cleonides, 205-06.

<sup>4</sup>º See H. Macran's discussion of Aristoxenus' intermodulation theory (n. 22, above, 229–32.

<sup>&</sup>lt;sup>22</sup>9-32.
<sup>41</sup> Since M (c) is also *mese* in the *tonos* of the fragment, a modulation here would be very subtle. However, subtle modulations are common in Turkish music. Two *makam-s* can be blended or shifted by altering *one* note or emphasizing different tonal centers (see Signell, 73-74). Moreover, Wright (p. 262) gives a description of "tantalizingly brief" modulations, noting a circumstance in which all the notes of two modulating sections were the same save four, with one final note identifying that the modulation had taken place.

As in Turkish music, when the borrowed note serves the function of emphasizing the centers of either the tonos in which it appears or the tonos to which it belongs, it usually does so at a significant textual moment.42 In almost every instance, the borrowed note will occur on a carefully chosen syllable of a word, usually the first or last, and can often be seen at a significant grammatical pause or stop in the text. Examples of borrowed notes occurring on the first syllable are: Berlin Papyrus: line 18, alitrón (wicked); Mesomedes Hymn One: line 3, phrase ap'alséon (from the sacred grove); First Delphic Hymn: line 12, anakídnatai (spread upwards [toward Olympus]), line 15, ōidaàn (swell in song), line 16, anamélpetai (praise in song); Oslo Papyrus: line 6, phrase phásgana katà (sword down over [the earth]); Second Delphic Hymn: line 32, árēs (Ares). Borrowed notes appear on the last syllable of words in: Berlin Papyrus: line 17, aīan (earth), line 19, helkesin (wound); Mesomedes Hymn One: line 4, emàs (my/mine); Mesomedes Hymn Two: line 6, mouson (of the Muses); First Delphic Hymn: line 12, taoúron (bull), line 13, anakídnatai (spread upwards), line 14, ligù (sweet, clear), line 16, anamélpetai (praise in song); Oslo Papyrus: line 6, phásgana (sword), line 7, thársei (take courage); Second Delphic Hymn: line 33, hugrãi (water/flow). And borrowed notes occur at a pause/stop in: Berlin Papyrus: lines 17, 19; First Delphic Hymn: lines 12, 14, 16; Oslo Papyrus: lines 7, 11. It seems clear that the composer wished to emphasize certain key words in the narrative by changing the melodic tone or mood at the moment when that word occurred in the text. This is common practice among the Persian and Turkish composers. 43

Thus far it has been suggested that the "single note borrowing" so popular in Turkish music seems to be a device used in ancient Greek music as well. The borrowed notes serve a variety of functions both aesthetic and structural. They may simply be colorful additions to provide a little contrast;<sup>44</sup> however the borrowed notes may provide a support for the tonal centers of all *tonoi* involved or facilitate a blending of boundaries between *tonoi*. Modulations on a grander scale are seen in Greek music, but ancient theorists mention that a single note can function as the common element in modulation between *tonoi*.<sup>45</sup>

<sup>&</sup>lt;sup>42</sup> Signell, 80. Often the borrowed note occurs on an odd rhymed line, on a carefully chosen word, and/or at the end or beginning of a line.

<sup>43</sup> The relationship between the poetry and the music is seen not only in melody structure but in rhythm especially. Persian and Turkish composers follow the ancient Greek practice of relating the rhythm of the music to the meter of the poetry. For a discussion of Greek meter and music, see J. Solomon, "Orestes 344–43: Colometry and Music," *Greek-Roman-Byzantine Studies* XVIII (1977), 71–83. See Zonis, 127; Signell, 80f.
44 For example, the repeated use of  $\Lambda$  on the words *phàsgana katà* (sword down across

For example, the repeated use of  $\Lambda$  on the words phàsgana katà (sword down across [the earth]), line six of the Oslo Papyrus may serve to emphasize the narrative action or change the emotion; any isolated occurrence of a borrowed note may serve to color a line.

<sup>&</sup>lt;sup>45</sup> Čleonides, 205; Aristides Quintilianus, trans. Mathiesen (above, n. 22), 89.

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Another point that might be examined is the use of borrowed notes for improvisation. In both Turkish and Persian music modulation is employed in improvisation.<sup>46</sup> Despite the fact that almost nothing about it appears in the literature, unwritten law dictates that "a musician who would remain blandly in the same *makam* for more than, say, three minutes, would be considered to have played something 'tasteless' or 'colorless'."<sup>47</sup> Accidentals may be introduced in certain cases as models for the improvisation, or in other words, to provide genetic materials such as modal/rhythmic features of a melody, shape, and mood/ character upon which the musician is expected to expound.<sup>48</sup>

There is no unassailable source from which we can be sure that ancient Greek music was ever improvised, but considering the increase in the variety of musical composition, freer rhythmic structure, and the possible rise of vocal and instrumental embellishments in the fifth century,<sup>49</sup> it should be considered as a possibility that borrowed notes could indicate a point of departure for improvisation in ancient Greek music. The notation that stands without text in the Orestes Papyrus (Pöhlmann #21)50 lines 4-6 and in the Oslo Papyrus line 2b may indicate that either instrumental or vocal improvisation is being signalled. The strange combination of instrumental notation with vocal text in the Second Delphic Hymn may show the collaborative efforts of a vocalist and an instrumentalist who, as in improvised Persian Radif, would follow the singer echoing each phrase or playing a slight variation.<sup>51</sup> Theodore Reinach proposed several theories as to why the instrumental notation was placed over vocal text in this piece. He thought it "invraisemble qu'on ait songé à perpétuer sur le marbre l'accompagnement de morceaux de chant dont on aurait supprimé la melodie."52 He argued that instrumental notation was always written below the melody, not above, and that in some instances one symbol stood for two different notes, an unusual phenomenon in an instrumental piece.<sup>53</sup> He did reiterate the suggestion of other writers that the instrumental signs could have been used to indicate that accompaniment was in unison with the singing (as in Persian Radif).54 There is, however,

<sup>46</sup> Signell, 66; Zonis, 46.

<sup>47</sup> Signell, 66.

<sup>&</sup>lt;sup>48</sup> Zonis, 46f. This is also a feature of songs from the Yemen. See W. Gerson-Kiwi, "Women's Songs from the Yemen: Their Tonal Structure and Form," in the Commonwealth of Music, ed. G. Reese and R. Brandel (New York, 1965), 100.

<sup>49</sup> OCD2, 711.

<sup>&</sup>lt;sup>50</sup> Solomon, 76, n. 13.

<sup>51</sup> Zonis, 138.

<sup>52</sup> R. Reinach, "La Musique des Hymnes de Delphes," Bulletin de Correspondance Hellenique XVII (1893), 605.

<sup>53</sup> Ibid.

<sup>&</sup>lt;sup>54</sup> T. Reinach, "La Musique du Nouvel Hymne de Delphes," Bulletin de Correspondance Hellenique XVIII (1894), 373. See Aristides Quintilianus, De musica, 23 (above, n. 22), and

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another alternative: the Second Delphic Hymn could indeed be an instrumental piece. Ella Zonis remarks that in Persian music, the words are so important that "even when there is no singer, the solo instrumentalist may play . . . as if the poetry were being sung."55 Persian avaz, primarily a vocal improvisation form, is unmeasured and depends on the meter of the text for rhythmic shape.<sup>56</sup> Zonis states that "in the Saba instruction manuals the poetry is written out for each avaz even though these pieces are for solo instrument."57 It is interesting to note that Sacadas, a soloist on the aulos, won a musical contest in the sixth century B.C. with an instrumental song composed in honor of Apollo's victory over the Python of Delphi,<sup>58</sup> and the Second Delphic Hymn, though much later in date, is also in honor of Apollo. Is it possible that the composer, knowing that the First Delphic Hymn was a vocal piece, decided to compose an instrumental piece with the intention that it be positioned next to the older hymn and the two be played together, either as vocal with accompaniment or vocal and instrumental solos, or perhaps alternating between the two as in Persian practice?59

Since we do not possess enough evidence to prove that ancient Greek instrumental music was composed without the poetry in all cases, it can be suggested that poetry was important enough to be written down even if the piece was for solo instrument. The Second Delphic Hymn is full of modulation—a new *tonos* appears almost every section—and borrowed notes are common, which are traits characteristic of Persian and Turkish improvised music. <sup>60</sup> The fragmented condition of the stone causes great difficulty in deciphering the music of this Hymn, but more investigation may bring to light further and more conclusive evidence about the form of this piece.

Whether or not the borrowed notes serve as signals for an impending improvisation, their other functions now seem clearer from the comparison with Turkish "single note borrowing." Further parallels can be drawn from Persian and, although not considered in this paper, Judaeo-Arabic and Indian traditions.<sup>61</sup> The observations made here

Anonyma Bellermanniana, *De musica*, ed. D. Najock (Leipzig, 1975), 22 for discussions of the different notations used for vocal and instrumental music.

<sup>55</sup> Zonis, 130.

<sup>&</sup>lt;sup>56</sup> Ibid., 128.

<sup>57</sup> Ibid., 127, n. 3.

<sup>58</sup> Plut. De mus. 8; Paus. 9.30.

<sup>&</sup>lt;sup>59</sup> Zonis, 124.

<sup>60</sup> Signell, 66.

<sup>&</sup>lt;sup>61</sup> An interesting comparison can be made between Indian use of "borrowed notes" in their raga system, which is much akin to Turkish makam and Persian gusheh. See B.C. Wade's discussion of "foreign notes" in her Music in India: The Classical Traditions (Englewood Cliffs, N.J., 1979), 61, and Lewis Rowell, "Early Indian Musical Speculation: The Theory of Melody," Journal of Music Theory XXV (1981).

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can only scratch the surface, however, because of the paucity and damaged condition of the extant Greek musical fragments and because of the lack of any written, theoretical basis for these procedures. Moreover, it is always risky and unverifiable to draw conclusions about Greek matters from ethnological analogy, since chronological and various cultural differences inevitably make parallels or even direct borrowings imprecise. Nonetheless, because the "borrowed notes" have been hitherto inexplicable, because it is evident in the works of al-Kindi, al-Farabi, and their followers that much of Islamic music is derived from ancient Greek theory, and because the criteria for the functions of the Turkish "single note borrowing" can be shown to resemble so closely these heretofore inexplicable notes in the Greek fragments, it would be unwise not to explore what little evidence and parallels we have. For the moment we have put aside western theory and examined instead the eastern parallels that help to isolate, categorize, and account for what has been a theoretical mystery in the study of ancient Greek music.

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Some Hellenic Ideas on Music and Character

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# SOME HELLENIC IDEAS ON MUSIC AND CHARACTER

# By LOUIS HARAP

TN PRACTICE it is not always easy to separate the technics from the aesthetics of an art. A first statement of this difference might be that technics gives an analysis of the internal structure of an art, while aesthetics treats of the relationships between the finished art object and human observers. The contrast is roughly between a study of the construction of a work of art and the enjoyment of it. The Greeks occupied themselves with both phases of musical studies—a fact that is not surprising in view of the prominent place held by music in the life of that speculative people. "Music," said Plato, "is more celebrated than any other kind of imitation." Although not a great deal of technical literature on music has survived, enough remains to assure us that this study was deeply investigated by the Greeks. I shall not here be much concerned with their technical theories of the octave, modes, or notation. In this essay, which makes no pretense to completeness, I shall try mainly to set down some ideas entertained by the Greeks upon how the enjoyment of music affected human character, usually designated as the "ethos" theory of music.2

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As everyone knows, the earliest and most basic of all musical discoveries in the West was made by Pythagoras, when he discerned the principle of the regular proportional relationship between the pitches.<sup>3</sup> The subsequent development of music would have been impossible without this knowledge. However, what is for us a technical principle

<sup>&</sup>lt;sup>1</sup> Laws 669 B. All passages from Plato are from the Jowett translation, unless otherwise specified.

<sup>&</sup>lt;sup>2</sup> The reader should be warned that this whole subject is fraught with conjecture and controversy. See the *caveat* of T. Reinach, *La Musique Grècque* (1926), pp. 44-45.

<sup>&</sup>lt;sup>3</sup> Curt Sachs has argued that both the discovery of the scale and the doctrine of the harmony of the spheres were not original with Pythagoras, but that this theorist gathered these ideas during student days in Egypt. See Curt Sachs, *Musik des Altertums* (1924), pp. 16 and 49, and the same author's *Die Musik der Antike* (1928), in *Handbuch der Musikwissenschaft*, edited by E. Bücken, pp. 3-4.

of music was to Pythagoras the primary metaphysical fact about the world. The Milesian philosophers, Anaximander and Anaximenes, had bequeathed to Pythagoras the problem of accounting for the existence of an ordered world in the midst of conflict and opposition. Pythagoras tried to solve the problem by the principle of harmony (άρμονία). By experimenting with a musical string he had discovered that the pitch intervals of the octave, the fourth and the fifth were related in a regular ratio. In other words, high and low pitches were resolved in an "attunement" (άρμονία) that resolved their opposition, for each was related to the other in due measure. Pythagoras reasoned analogously from this example of numerical regularity to everything else, and he thought harmony was the clue to an explanation of the world.4 Human life, to be properly healthful and ordered, should also be harmonious. The relations of elements in life, both internal and external to the individual, must make a "healthful music," as Hamlet says. For the soul, if it is healthful, is attuned to the harmony made by the heavenly bodies. This is the famous idea of the "harmony of the spheres," which does not, as is popularly supposed, denote the music made by the motion of all the heavenly bodies in concert. This is a much later development than Pythagoras. The earlier astronomy permitted only a crude, limited conception of the heavens (for example, the sun and moon were not thought to be "spheres," but circles) and the harmony of the spheres is rather a condition of the soul, so that it vibrates sympathetically with the fourth, fifth and octave given out by the heavenly circles in their motion.<sup>5</sup>

Music and mathematics, because they presented the soul with pure instances of harmony, were held by Pythagoras to have purgative effects. He was the first among philosophers to expound the idea of catharsis, which had been transmitted to him through the Orphicism in his religious background. The idea of catharsis by music was present in the ancient tradition that Orpheus with his lute calmed beasts and that Amphion moved the stones with his music. The καθαρμοί, rites of purification by enthusiasm, were regularly practised in the Orphic religions as a means of releasing the soul from its bodily tomb. Pythagoras carried this idea further in prescribing appropriate music for each specific type of mental disturbance, and in his doctrine of the harmony of the "circles." Iamblichus relates that "Pythagoras was likewise of opinion

<sup>&</sup>lt;sup>4</sup> It should not be necessary to remind the reader that harmony signified to the Greeks a linear series of pitches, and not a simultaneous concord.

<sup>&</sup>lt;sup>5</sup> Cf. J. Burnet, "Early Greek Philosophy", 3rd ed., pp. 110, 306 ff., and his article, "Pythagoras and Pythagoreanism" in Hastings' "Encyclopedia of Religion and Ethics", vol. X, p. 528.

that music contributed greatly to health, if it was used in an appropriate manner. . . . And he called the medicine which is obtained through music by the name of purification. . . . But he employed such a melody as this during the vernal seasons. . . . And there are certain melodies devised as remedies against the passions of the soul, and also against despondency and lamentation, which Pythagoras invented as things that afford the greatest assistance in these maladies." After specifying more of these remedies, Iamblichus concludes that "after this manner, therefore, Pythagoras through music produced the most beneficial correction of human manners and lives." Pythagoras believed that the hearing of sounds which bore certain arithmetical relationships had a powerful and quite specific effect on the soul. The movements in each piece of music produced similar movements in the soul. Since desirable states of the soul could be induced by suitable music, it assumed great importance for moral life. Pythagoras had finally deepened the primitive conception of purification by music when he founded it upon a universal metaphysical theory of harmony.

As might have been expected, his followers developed in two directions. Some of them became absorbed in his mathematical theory of music, while others were preoccupied with the ethos theory of the effect of music upon character. Among the earliest of the former was Lasos, one of the seven sages, who was said to have been the instructor of Pindar in lyric composition and a composer as well as a theoretician. He was the first Greek to write on music, establishing in writing the theoretical system of Greek music and giving definitive form to its technical vocabulary; and he was perhaps the founder of notation for vocal music.8 On the side of the ethos-theory the outstanding exponent was Damon the Athenian, a friend of Socrates and also of Pericles, and thus in a good position to gain a wide hearing for his ideas. It was Damon who laid down a prohibition of the aulos, because he thought the ethical effects of the cither and lyre to be superior to the relaxing influence of the aulos. He gave to Pythagorean ethical teachings on music their standard form and carried out their implications for the life of the community. The political and social significance of music was emphasized by him for, according to Plato, Damon said, "that when modes of music change, the fundamental laws of the state always change

<sup>&</sup>lt;sup>6</sup> Iamblichus, "Life of Pythagoras", trans. by Thomas Taylor (1818), ch. XXV, pp. 80-82. 7 *Ibid.*, p. 83.

<sup>&</sup>lt;sup>8</sup> On Lasos see F. A. Gevaert and J. C. Vollgraf, Les Problèmes Musicaux d'Aristote (1903), pp. 103-107.

with them." He also exerted great influence upon Greek education by elaborating the relation of melody, rhythm, 10 and tone quality to the dispositions of the soul. Damon's articulation of the ethos-theory and his emphasis upon the political aspect of music form the basis of these ideas in Plato and Aristotle.

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Of all the adherents to the view that music influences character Plato was the most severe and uncompromising. He states in its extreme form the view that the beautiful in music is an imitation of the virtuous. "And not to be tedious," he said decisively, "let us say that the figures and melodies which are expressive of virtue of soul or body, or of images of virtue, are without exception good, and those which are expressive of vice are the reverse of good."11 The ethical element in Plato's use of καλός as the "beautiful" dominates in this passage. In other words, beauty in music depends on ethos, or the character it expresses. For the ethostheory is based on the view that music directly and precisely imitates human dispositions, because of the similarities of movement in music and in the soul. The Greeks conceived of the soul as being in motion when affectively alive (hence the term "emotion"). Plato said that melody has "movements akin to the revolutions of the soul within us." 12 The musician must know, relative to "harmonies," what are "the affections corresponding to them in the movements of the human body, which when measured by numbers ought, as they say, to be called rhythms and measures."13 Melodies express the virtues of the soul and body or their vices.14 "Everyone will admit," Plato affirmed, "that musical compositions are all imitative and representative."15

If we consider as a whole all the scattered passages on the ethostheory in Plato, we find that the musical motion which is a reconstruction of the soul's movement is not simple, but the resultant of several simultaneous motions. It is not only the tonal movement from one note to another, that is, the melody, that Plato regarded as determining the ethical character of music, but also rhythm, tempo and tone-quality of

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9 "Republic" 424 C.

10 Cf. "Republic" 400 B-C.

11 "Laws", 655 B.

12 "Timaeus" 47 D, trans. A. E. Taylor. Cf. also "Laws" 790 C f.

13 "Philebus" 17 D.

14 "Laws" 655 B. Cf. also 789 D.

15 "Laws" 668 B.
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the instrument. Hermann Abert has given the name Gesamtethos to this resultant ethical character of music in a work indispensable for the understanding of this entire subject. 16 Of this resultant ethos, rhythm and melody are the chief, but not total, constituents. The melodic aspect of music is comprehended by the modal system. Some of the Greeks believed that each mode expressed the dominant national character of the states in which they were prevalent, and the modes were duly named after the localities of their presumed origin-Dorian, Phrygian, Lydian, Ionian and Aeolian.<sup>17</sup> All of these modes finally became familiar in Athens, much to the distress of the defenders of the ancient Dorian mode, which was, according to Plato, "the true Hellenic mode, . . . which is a harmony of words and deeds." 18 To this mode was attributed the cardinal Greek virtue of temperance, and the temperament of the ideal citizen finds expression in it. The Phrygian mode manifests courage and is useful when citizens need to ward off dangers to themselves and to the republic. These two, the Dorian and Phrygian, are alone worthy to be retained in Plato's ideal state. 19 Plato is peculiar among the ancients in thus regarding the Phrygian as the mode of courage, for all others characterized it as the enthusiastic, orgiastic mode. Aristotle specially criticizes Plato for retaining the Phrygian mode while rejecting the aulos, "for the Phrygian is to the modes what the flute [aulos] is to musical instruments—both of them are exciting and emotional."20 It may be, however, that Plato's "Phrygian" was a different mode from the one Aristotle knew by that name, and one of an older system. Plato completely rejects the other modes, for they are "relaxed" and debilitating. The Lydian mode is melancholy, expressive of sorrow and lamentation; the Ionian has the quality of softness and indolence and accompanies drunkenness.<sup>21</sup>

Rhythm, as well as melody, contributed to the total ethos of a composition, and hence rhythm must be consonant with the melody in disposition. For this reason Plato enjoins care in the selection of songs appropriate for men and women, respectively, saying that the state

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16 Hermann Abert, Die Lehre vom Ethos in der Griechischen Musik, Leipzig, 1899.
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<sup>17</sup> But see "Oxford History of Music", Introductory Volume (1929), p. 11.

<sup>18 &</sup>quot;Laches" 188 D, 193 D.

<sup>19 &</sup>quot;Republic" 399 A f., "Laws" 660 A.

<sup>&</sup>lt;sup>20</sup> Aristotle, "Politics", tr. Jowett, 1342 b 2-3.

<sup>&</sup>lt;sup>21</sup> "Republic" 398 C. For an extended discussion of the ethical character of the modes see Abert, op. cit., pp. 69-100; A. Gevaert, Histoire et Théorie de la Musique de l'Antiquité (1875), Vol. I, pp. 178-199.

"must assign to them their proper melodies and rhythms." 22 The tempo (ἀγωγή) is another constituent of the total ethos of music.<sup>23</sup> Plato reports that Damon "appeared to praise or censure the movement [tempo, ἀγωγή] of the foot as much as the rhythm; or perhaps a combination of these two, for I am not certain what he meant."<sup>24</sup> It will be noticed that rhythm is here sharply distinguished from tempo, showing a high degree of sophistication in musical theory. And to these factors which together make up the final ethos of music, the tone-quality of instruments must be added. Plato was so severe as to condemn purely instrumental music because its ethos could not be unequivocally known in the absence of a discursive text.<sup>25</sup> The aulos, at any rate, is definitely known to have an indubitably bad ethos, and is completely to be forbidden, as Plato affirms,<sup>26</sup> following Damon. The simple lyre and harp may be used (although not apart from a text or a dance, we may assume), for at least they are not intrinsically luxurious instruments.<sup>27</sup>

In view of this belief in the powerful and direct effects which music produced upon character, the Greeks naturally were careful to prescribe the part that music was to play in education. It should be noted that Plato, and others like him tinged with Pythagoreanism, conceived of music not only as the special art of sound, but also in a wider sense as a generic means of producing harmony and proportion, toward which end the art of sound loomed large. Poetry, singing, and dancing were "musical" arts. In Plato's scheme of education, music, in this broader meaning, was to train the soul to a sense of proportion, while a harmonious state of the body is achieved through the second main part of education, gymnastic. This was probably the usual Greek conception of music, for we find Protagoras, in the dialogue of Plato named after him, recommending musical education, in the large sense, for the young, to make the proper "harmonies and rhythms quite familiar to the children's souls, in order that they may learn to be more gentle, and harmonious, and rhythmical, and so more fitted for speech and action."28 Plato laid down very strict regulations in the musical education of the

<sup>22 &</sup>quot;Laws" 802 D. Cf. also "Laws" 669 B f.

<sup>23</sup> This was first pointed out by Abert, op. cit., p. 128.

<sup>24 &</sup>quot;Republic" 400 C.

<sup>25 &</sup>quot;Laws" 669 C f. This problem does not seem to have troubled Aristotle. Though he recognizes that "music, even if it is unaccompanied by words, yet has character," ("Problemata" 919 b 27) he seems not to have feared the risk involved in purely instrumental music.

<sup>26 &</sup>quot;Republic" 399 C. 27 "Republic" 399 D-E. 28 "Protagoras" 326 B.

young. In the "Republic" (Books II and III) he expounds at length the details of a rigid censorship of poetry and music, and reverts to the subject in the "Laws" (797 ff.). Music is to habituate children to harmonies and states of mind favorable to the conservation of the republic: children are educated in music that they "may not be habituated to feel joy and sorrow in a manner at variance with the law, but may rather follow the law."<sup>29</sup>

Although the same ethical principles apply to music both in the wide and narrow senses, our main concern here is with their application to the art of sound. Because the influence of music on character is so great, this art must be regulated not only for children, but for citizens of all ages. "Melody," wrote Plato, in a Pythagorean vein, "with its movements akin to the revolutions of the soul within us, has been given by the Muses to him who uses their company with understanding, not for foolish pleasure, which is thought to-day its function, but as an ally for the revolutions of the soul within us that has been put out of tune, to bring it back to order and consonance with itself. Rhythm also was granted us to the same end."30 This therapeutic function of music is not as prominent in Plato as that of reinforcing temperance and civic virtue. The soft, sweet and melancholy airs in the Ionian modes, for instance, conduce to effeminacy and thus weaken the fighting spirit of the warriors.31 Musical innovation is dangerous to the state because the spirit of license introduced by innovation "imperceptibly penetrates into manners and customs" and leads progressively to a degree of lawlessness that finally undermines the state.<sup>32</sup> Classic simplicity of melody and rhythm must be preserved. Plato protests against the increasing complexities of rhythm and melody then being introduced into Greek music, for such complexity engenders license and disease of the soul.<sup>33</sup>

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The uncompromising aspect assumed by the ethos-theory in Plato becomes considerably softened when subjected to the less ardent mind of Aristotle. We shall see that the latter departs from the Platonic view in assigning a self-sufficient value to serious music. Though Aristotle's

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29 "Laws" 659 D.
30 "Timaeus" 47 D, trans. A. E. Taylor.
31 "Republic" 411 A-D.
32 "Republic" 423 B f. Cf. also Laws 700 C, 797 D f.
33 "Republic" 404 E. Cf. also 399 B, 400 E.
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technical knowledge of music was greater than that of his master, he follows Plato closely enough for a long way. Music, for Aristotle, was a form of imitation. "Rhythm and melody," he wrote, "supply imitations of anger and gentleness, and also of courage and temperance, and of all the qualities contrary to these, and of the other qualities of character." 84 This is reaffirmed in the "Problemata" which, if not by Aristotle himself, is undoubtedly Aristotelian. The movement to which sound gives rise "resembles moral character both in the rhythms and in the melodic disposition of the high and low notes."35 The ethos-theory, that is, music as an imitation of character, is then the particular form which the imitation takes in the case of the art of sound. According to Aristotle the modes are of three kinds: the ethical (ἡϑικὰ), representing the feeling which accompanies a moral decision; the active (πρακτικά), which incites to overt action, as in military music, or represents overt actions somewhat in the manner of program music; and the enthusiastic (ενθουσιαστικά), the mode of extreme agitation, which is homeopathically administered as a purgative to excited persons.<sup>36</sup> Besides the melodic mode, rhythm too has an affinity to human character,<sup>37</sup> as also do musical instruments.<sup>38</sup> Aristotle urges special care upon the dramatist that his music be appropriate to the character expressed in the poetic text, 39 just as Plato says of the music to be allowed in his "Republic" that "the melody and rhythm will depend on the words." 40 And like him, Aristotle too regards the Dorian mode as producing "a moderate and settled temper, which appears to be the peculiar effect of the Dorian."41 The effects of the relaxed modes are debilitating, while other modes, like the Phrygian, are excited and have a purgative effect.

When Aristotle comes to name the legitimate uses to which he believes music can be put, the difference in their views stands out. Aristotle declares himself to be in substantial agreement with "philosophers," probably Plato and Damon, among others, on the rôle of music in education.42 The Dorian mode is particularly fitted to the education of

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34 "Politics" 1340 a 19-23. All citations from Aristotle are taken from the Oxford translation
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<sup>35 &</sup>quot;Problemata" 919 b 33-34.

<sup>36 &</sup>quot;Politics" 1341 b 33-35. This classification is continued by the Aristoxenians. Cleonides (pseudo-Euclid) notes the three styles as hesychastic, systaltic and diastaltic.

<sup>37 &</sup>quot;Politics" 1340 a 19.
38 "Politics" 1341 a 21-23.
39 "Problemata", ch. XIX, 48, 922 b 10 f.

<sup>40 &</sup>quot;Republic" 398 C.

<sup>41 &</sup>quot;Politics" 1340 b 3-4. 42 "Politics" 1340 b 5-6.

the young because it is the mean between the relaxed Lydian and the excited Phrygian, and the mean in all aspects of life promotes virtue.43 And "music has the power of character, and should therefore be introduced into the education of the young."44 Habituation to true and virtuous pleasures that results from training in the right music makes it a powerful weapon for education. From this point on, however, Aristotle goes beyond Plato. He held that music taught in youth cultivates the taste for music to be fully enjoyed in maturity. 45 He also grants that enthusiastic music has a proper function as catharsis; "for feelings such as pity and fear, or again, enthusiasm, exist very strongly in some souls, and have more or less influence over all."46 Purgation of this excess in emotional life Aristotle considered entirely proper, not only in music, but in tragedy as well. He saw all orders of life on their own terms and dealt with them accordingly, while for Plato every aspect of life was subordinated to the transcendent ideal of philosophic vision. The earlier Plato tended to ignore common needs and in large measure condemned those activities that did not directly promote the life of vision.<sup>47</sup> Although Plato does admit the cathartic function of music in a Pythagorean passage ("Timaeus" 47 E), this admission is an isolated one. Otherwise he forbids the exciting music of the aulos, while Aristotle deals differently with this question. There is a "proper time" for playing the aulos, "when the performance aims not at instruction, but at the relief of the passions."48 In other words, this use of the music of the aulos is just what we found in Pythagoras: a homeopathic treatment of an agitated emotional state by orgiastic music.

Besides the use of music for education and for catharsis, Aristotle notes its function as relaxation and recreation, which, we conjecture, must have meant to the Greeks what amusement, as contrasted with serious art, means to us. Plato also approves of amusement, if nothing of importance is involved. But as usual Aristotle goes farther than Plato when the former permits "perverted melodies and highly strung and unnaturally coloured melodies" for the relaxation of mechanics and laborers who, owing to their lack of education, cannot enjoy the ethical

<sup>43</sup> Plato, as we may recall, preferred the Dorian because he thought it the mode of temperance, the Platonic equivalent to the Aristotelian mean.

<sup>44 &</sup>quot;Politics" 1340 b 11-12. 45 "Politics" 1339 a 25 f.

<sup>46 &</sup>quot;Politics" 1342 a 5-7.

<sup>47</sup> This view is somewhat mitigated by Plato in his "Philebus."

<sup>48 &</sup>quot;Politics" 1341 a 23. Cf. also 1342 a 5-16.

melodies.<sup>49</sup> Plato would never have made such a concession to vulgar taste. A fourth, and very significant, use of music named by Aristotle is that of enjoyment for its own sake as a disciplined, "intellectual" activity (διαγωγή).<sup>50</sup> Such self-sufficient activity is for Aristotle the end of human life, the complete realization of man's rationality. All liberal pursuits—that is, those which are not "useful or necessary" 51—are enjoyed for themselves alone, each in its own right. Musical activity of this kind is not merely pleasant, like relaxation, but one in which the pleasant (ήδονή) is joined with the rationally fine (καλὸν).<sup>52</sup> On the whole, however, Aristotle resisted the dual tendency of Plato to subordinate the individual to the state, even to the extent of drastic limitation of their enjoyment; and, as Plato so often does, to regard as unworthy any form of activity which did not directly promote the philosophic vision. As a result, Aristotle countenances a wider range of musical enjoyment.

Aristotle's naturalism and respect for the empirical are reflected in the musical ideas of his followers, and chiefly in Aristoxenus, called ὁ μυσιχός, "The Musician," by the ancients, much as the mediaevals called Aristotle "The Philosopher." What we know of him justifies the title, for he was without doubt one of the greatest of all musical theorists. His solution of the problem of the well-tempered scale<sup>53</sup> was lost upon antiquity and was not known again until Werckmeister re-created and Bach re-introduced it. Our knowledge of Greek music owes more to him than to anyone else. Of all the Greeks, he saw most clearly the essence of music; and his conception reveals a rare insight into the sensuous and organic nature of the art. He conducted a polemic against two extreme schools of musical theory in his time. On the one hand there were the Pythagorean mathematical physicists who saw music as a discipline concerned with numerical proportions and thus completely overlooked its essence, its aspect as sound. Sensuous data were reduced by the Pythagoreans to their numerical equivalents, proportional string lengths; and they regarded these numerical data as musical phenomena.

<sup>49 &</sup>quot;Politics" 1342 a 19-27.
50 "Politics" 1338 a 1 f.
51 "Politics" 1338 a 31.
52 "Politics" 1339 b 17-19. Plato approaches this point of view in the "Philebus," where he says that the good in itself is a mixture of pleasure with knowledge (επιστήμη) (60 A f.), and then includes musical knowledge among these goods (62 C).

<sup>53</sup> But see "Oxford History of Music", Introductory Volume (1929), pp. 4-5.

As Aristoxenus expressed it, these rationalists asserted "that height and depth of pitch consist in certain numerical ratios and relative rates of vibration—a theory utterly extraneous to the subject and quite at variance with the phenomena."54 At the other extreme were those naive empiricists who fastened upon some single field within music and regarded it as the whole of harmonic. Some devoted themselves exclusively to a study of musical notation, but Aristoxenus observes acutely that, "if a man notes down the Phrygian scale, it does not follow that he must know the essence of the Phrygian scale,"55 just as one can know all the literal facts about metre without getting at the essence of poetry. Similarly some simple musicians defined harmonic as "the knowledge of clarinets [auloi], and the ability to tell the manner of production of, and the agencies employed in, any piece rendered on the clarinet [aulos]."56 To which Aristoxenus replies that all instruments alike participate in the general laws of harmony, but that each instrument employs means peculiar to its limited nature. Harmony in general is broader than the adaptation of sound to any single instrument.

For Aristoxenus music depended inseparably upon both immediate sense-discrimination of sound and the ability to relate such discriminations—both "hearing and intellect," as he says.<sup>57</sup> Fine sense-discrimination is not called for in geometry, since the deductive procedure of this study requires only crude vision to indicate and illustrate those abstract principles and axioms under discussion. It is rather the carpenter or handicraftsman who must exercise keenness of vision analogous to the sensuous discrimination of the musician in sound. In order to prove facts about pitches and their relations, such sounds must be accurately discriminated. Aristoxenus consequently thinks of music as a science of melodious sound,<sup>58</sup> and "of all the objects to which the five senses apply not one other is characterized by an orderliness so extensive and so perfect." 59 He saw further that previous theorists had not grasped the sensuously dynamic nature of music, for he realized that, not only did notes have pitch, and not only did pitches stand in formal, mathematical relations one to the other, but also that each note had an auditory func-

<sup>54 &</sup>quot;The Elements of Harmony," tr. by A. S. Macran (1902), 32 M (Meibohm pagination).

<sup>&</sup>lt;sup>55</sup> *Ibid.*, 39 M.

<sup>&</sup>lt;sup>56</sup> Ibid., 39 M.

<sup>&</sup>lt;sup>57</sup> Ibid., 33 M.

<sup>&</sup>lt;sup>58</sup> For his interesting distinction between speech and music (melodious sound), see "The Elements of Harmony," 8 M ff.

<sup>&</sup>lt;sup>59</sup> Ibid., 5 M.

tion. Each note in a melody bore an organic relation to the other notes. "Melody which accords with the laws of harmony," said Aristoxenus, "is not constituted by intervals and notes alone. Collocation upon a definite principle is also indispensable."60 This is the basic principle of formal analysis in music. Although, so far as I know, the ancients made only primitive analyses of musical form (for the good reason, probably, that their music was not formally complicated like ours), this great discovery of the organic nature of music by Aristoxenus certainly provided theoretical foundations for such a study. "It is plain," he said, "that the apprehension of melody consists in noting with both ear and intellect every distinction as it arises in the successive sounds . . . For the apprehension of music depends on these two faculties, sense-perception and memory."61 Aristoxenus combined in himself the virtues of Pythagoras and Aristotle, a sense of the importance both of abstract relations and of empirical data. It was very unfortunate that the Greeks failed to see the importance of this aspect of Aristoxenus' theory, and it soon dropped from attention.

Aristoxenus inherited another trait of Pythagoreanism, namely moral severity, as was manifested in his adherence to the ethos-theory. In the "Elements of Harmony" references to ethos are very sparse. Of a certain style he says that "far from being contemptible, it is perhaps the noblest of all styles."62 But he expresses some doubt as to the effects of music on character. He rebukes certain people for giving too broad a scope to his statement that "'one class of musical art is hurtful to the moral character, another improves it,' while they missed completely our qualification of this statement, 'in so far as musical art can improve the moral character.' "63 Unfortunately he does not elaborate upon this qualification in the writings left to us. Nevertheless, if the evidence from Plutarch is to be credited, Aristoxenus was no less severe in his ethos-theory than Plato. Like the latter, he condemned the vocal music just emerging, and regretted the departure from the simplicity and seriousness of the older music.<sup>64</sup> Aristoxenus sees the utility of music in forming the character of the young, and of arousing the war-like spirit in soldiers. 65 He also insists

<sup>60</sup> Ibid., 18 M.

<sup>61</sup> Ibid., 38 M.

<sup>&</sup>lt;sup>62</sup> Ibid., 23 M.

<sup>63</sup> lbid., 31 M.

<sup>64</sup> Plutarch, De la Musique, tr. by H. Weil and T. Reinach, ch. 12. Cf. also ch. 18. Westphal has shown that the passages I shall cite at this point were taken from the "Table-Talk" of Aristoxenus. Cf. Plutarch, Über die Musik, tr. and ed. by R. Westphal (1868), pp. 19 ff.

<sup>65</sup> Ibid., ch. 26.

that it does not suffice the musician to possess a technical knowledge of rhythm and melody. Combined with these, the complete musician must have a thorough sense of the ethos of music. He must know how to fit the text of a song or the ethos of an instrumental piece to its appropriate mode and rhythm. "Whoever wishes to be a complete musician," he wrote, "must combine a knowledge of musical theory and technique with correct musical judgment," and by musical judgment he was referring to a sense of propriety of rhythm and melody to the ethical character the musician intended to convey.

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The ethos-theory did not pass unchallenged in antiquity. A certain school, which Abert calls the "Formalists," denied that music either resembled character or affected its development. The fullest expression of this view is to be found in Philodemus (First Century B.C.). In 1899, Hermann Abert had affirmed that, although hardly any Formalist writing before Philodemus had survived, this writer was really expounding ideas advanced by the Sophists of Fourth Century B.C. in opposition to the ethos-theorists.<sup>67</sup> Abert showed that Philodemus was expressing the views of Epicurus, who in turn derived in this matter from Democritus. We know that Democritus investigated the physics of hearing and that he regarded music as a late acquisition of man, an article of luxury rather than necessity. He was a Sophist of the Greek enlightenment, during which all traditional views were questioned, among which must have been the theory that music had an ethical character. Human institutions and knowledge, the Sophists maintained, were not expressions of natural law (φύσις) but convention (νόμος) with no deeper foundation or validity than acquiescence. The obvious subjectivity of the response to music could not have escaped their critical minds, and, in fact, Abert holds that on several occasions, when discussing the ethos-theory, Plato seems to be answering opponents.

In 1902, three years after Abert had conjectured in the absence of any documents that the Sophists were violently opposed to the ethos-theory, a manuscript dating from the third or fourth century B.C. was discovered which strikingly confirmed this conjecture. The author of the

<sup>66</sup> Ibid., ch. 36. Cf. also chs. 32-36.

<sup>67</sup> The account of the Formalists here given is largely drawn from Abert's Die Lehre vom Ethos, etc., pp. 27-43. The position is also briefly summarized by Abert, "Die Stellung der Musik in der Antiken Kultur," Die Antike, vol. 2 (1926), pp. 140 ff. Cf. also Abert, Die Musik der Griechen, in his Gesammelte Schriften und Vorträge (1929).

manuscript disputes the claims that music imitates character much in the same manner as Philodemus. For, says this author, "Who is there who does not know that the Aetolians and Dolopes, and all the folk round Thermopylae use a diatonic system of music, and yet are braver than the tragedians who are regularly accustomed to the enharmonic scale?" From such an argument it does not follow necessarily, as the opponents of the ethos-theory maintained, that music does not imitate character. At best this argument can show that the ethos of any given scale is no conclusive index of the entire character of the group in which such a scale is prevalent.

According to Philodemus, music is in itself a combination of sound and rhythm, and has a purely external, physical nature bearing as little internal relation to human feelings as cookery. Music can imitate nothing, and is without influence upon the soul either for good or evil. Where song appears to move the hearer, it is really the poetic text which produces this effect, and not the sound. The religious influence of music, too, passes through poetry rather than the music proper, as is also the case with love songs and drinking songs. The sole purpose of music is to give pleasure and relaxation, hence the entire system of ideas arising out of the view that music has ethical character is false, and its educational and purgative values are misplaced.

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This essay comes to a close with a few bare hints at connections between ancient musical aesthetics and recent thought on the nature of music. The ethos-theory in some form or other has probably always existed. Professor Hugo Leichtentritt has recently shown in *The Musical Quarterly* some facts about Handel's tonalities that reveal a practice similar to the Greek use of modes according to their ethos. <sup>69</sup> Amply fortified with examples, Professor Leichtentritt shows that "Handel ascribed a distinct emotional force" to each one of the keys, which he used consistently to express these emotions. For example, "F minor is

<sup>68</sup> This MS is translated in "The Hibeh Papyri," Part I, London, 1906, p. 48, by B. P. Grenfell and A. J. Hunt. It is succinctly discussed in J. F. Mountford's contribution to "New Chapters in Greek Literature", Second Series (1929), pp. 181-182. See also Abert's remarks on this find and his translation of the MS into German: Hermann Abert, Ein neuer musikalischer Papyrusfund in Zeitschrift der internationalen Musikgesellschaft, 1906, pp. 79-83.

<sup>69</sup> H. Leichtentritt, "Harmonic Art of Handel," in *The Musical Quarterly*, vol. 21 (1935), pp. 208-219.

<sup>70</sup> Ibid., p. 212.

the key generally chosen to express profound sadness, F-sharp minor denotes tragedy," etc.<sup>71</sup> This is to modern music what the ascription of ethos to each mode was to ancient. An investigation of the practice of composers over the entire history of music on these lines probably would essentially confirm the ethos-theory of the Greeks.

However, one cannot think of the ethos-theory without recollecting Hanslick's onslaught upon this sort of conception of music.<sup>72</sup> It would require a separate article to open the question of how much validity there may be in each of these views. For our purposes, however, I should like to indicate briefly those points in our account at which the ancients approach the absolutist conception of music.

In his specific ideas on music Plato is perhaps the farthest removed from the view that music is essentially a well-ordered sensuous structure of tone, for he explains the beautiful in music wholly in terms of the virtue of the dispositions it imitates. On the other hand Aristotle comes closer to expressing the self-sufficiency of musical enjoyment of which modern musicians are more keenly aware than the ancients appear to have been. For Aristotle holds that music is one of the liberal, intellectual pursuits (διαγωγή) that are self-sufficient. But Aristoxenus came even closer to an understanding of the specific internal nature of music than any other theorist of antiquity. After all, the διαγωγή of Aristotle was a general term applying equally to that self-sufficiency attached to the association of friends, or to thought itself. Aristoxenus saw concretely that music was essentially a matter of auditory discrimination, and that music was an organic structure of sound, as he maintained in the idea that each note of a composition performed some function in the whole. To him music was an art of sensuous dynamics, and by advancing this technical conception of music perhaps for the first time Aristoxenus showed his genius as a theorist.

It should not be inferred that Aristoxenus' adherence also to the view that music imitated human character involved him in any inconsistency with this acute technical analysis of music. For it could be maintained that, while music is a sensuous, dynamic structure of sound and a cumulative compounding of sound and rhythm, this structure at the same

<sup>&</sup>lt;sup>71</sup> *Ibid.*, p. 212.

<sup>72</sup> It might be interesting to point out that Hanslick was not as well-informed on ancient musical aesthetics as he should have been. He wrote: "Though the idea of *motion* appears to us a most far-reaching and important one, it has hitherto been conspicuously disregarded in all enquiries into the nature and action of music." ("The Beautiful in Music", p. 38). The ethostheory in Plato and others was in fact founded precisely upon a similarity of the motions of music with those of the soul. E. g., see above, p. 156.

time represents ethical character through a similarity in its dynamic aspects with human feeling. But this is a large question into which I cannot venture here. Of all the theorists of antiquity, the most extreme in their denial of any ethical or emotional character of music were the Formalists. So far as we can ascertain, they did not possess that comprehensive and well-articulated knowledge and insight that Aristoxenus had. Somewhat in the manner of Hanslick, they looked upon music as a special, self-contained activity. Their view was more extreme than that of Hanslick, for they held that music could not produce emotion. It was the text, rather than the music proper, that had this effect. Hanslick, far from denying the power of music to evoke emotion, affirmed it very strongly, and he also maintained that music had a dynamic aspect in common with emotions. To the Formalists, music was no more nor less than a structure of sound and rhythm, neither itself possessing a pathetic element nor evoking it in human beings.



Music in the Life of the Ancient Greeks

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# MUSIC IN THE LIFE OF THE ANCIENT GREEKS

### By HERBERT ANTCLIFFE

OR those of us who live in the twentieth century of the Christian Era, nearly two thousand years since the last of all that made "the glory that was Greece" ceased to operate, music has little or no part in "le miracle grec." That it had a part in its creation we know, but so completely have the songs, the flute-dances, the martial trumpet-calls which constituted such music, failed to leave any continuing record, that most of us refuse to take any trouble to discover what that part was. We are content to know that some of it was intimately associated with songs and dramas that have become models alike of thought and language for all nations, but that now stand alone without any music except that of the richness of the vowel sounds and the perfect balance of their verbal rhythm. Even the magnificent studies of the technique and character of Greek music which have been made by such authorities as H. S. McCran, Westphal, Louis Laloy, Monro, and Abert fail, as a rule, to give us any real idea of the position which the art of music took in the life of the people. The comprehensive new edition of Grove's Dictionary of Music and Musicians has a long and learned article on the tonalities of Greek music, with scarcely a single word as to the daily practice of the art which gave rise to those tonalities. In this respect modern musical historians outvie the ancient Greeks themselves who, as Georges Clemenceau has said, loved "la musique de parler" without any action arising from or corresponding to their wellformed and roundly delivered words and phrases.

Yet all the records of practitioners and theorists which remain to us lead to the assumption that music, the music of voices and instruments, must have taken a very considerable position in nearly every department of Greek life, artistic, religious, social and political. Even these technical studies suggest something of the place it took in the political life of the nation, for they tell us that the original modes or scales were called Phrygian, Lydian, Ionian, and Dorian after the chief tribes which, at the end of a long period of mutual struggles, eventually became loosely united as the Hellenic nation or Empire. Few of them,

however, make any suggestion that these modes grew out of the natural music, the music that was often artless and unscientific, of the people whose names they bore, and so acquired the different characteristics which made Plato and others recommend or denounce them according to their virility or their effeminacy. To read many of these technical descriptions of Greek music one might suppose that the scales were artificially formed and arbitrarily named, after which some little use, in what manner and to what extent would appear to be a matter alike of ignorance and indifference, was made of them by composers and executants whose lack of skill was balanced by their roughness and conceit.

So far from this being true, the character of these modes and of the music in which they developed was the character of the people themselves who sang and played such music, and was exhibited not only in their music but in all their arts, emotional or representative. To this day we use the adjective Doric when we speak of the broad-vowelled dialect of Scotland, because in character that dialect corresponds with standard southern English in much the same way as the Dorian dialect corresponded with the Ionian Greek spoken by the Athenians, while the differences between Doric and Ionic architecture are much the same as those between the forms of the language and the innate character of the music.

Whether there was any reflex action or influence, whether the poets and musicians, the architects and their colleagues exercising themselves in the plastic and graphic arts, as artists, influenced the character of the tribes among whom they lived and worked is a question which can be discussed only as an abstract one of theoretical psychology and ethnology, for we have no certain evidence either way. In any case, the whole circumstances provide an early, but very definite case of tribal, national or racial character in music.

It is, unfortunately, true that the remains of ancient Greek music, if it can be said that there are any real remains at all, are such as give us little or no idea of what their melodies were. One thing which may be taken as certain is that their music varied in type and quality, in popularity and official recognition, in application, in every respect and every aspect, in fact, at all the various times when and in all the various places where it was practised. We can just as readily say that the music of the Anglo-Saxons is or is not a certain thing as we can say the same of the music of the Ancient Greeks. It is not altogether unlikely, even, that there was as much difference between the music of the

time of Homer and that of Ptolemy as there is between that of (say) Bishop Anselm and of Edward Elgar. Equally the practice of music would, and did, vary, and it is possible to trace some such variations as between the earlier and later periods, and as between the Ionians and the Spartans, though more difficult to trace any differences between those of the other tribes except as they remain in the different modes.

The traditions on which Greek music were based dated from the most primitive times, possibly, if not probably, from those of the Stone Age, and the legends which Homer gathered into his great poems were sung, so far as we can tell, some of them to the verses which now pass as his, by minstrels who travelled through the islands and mainland around the Ægean Sea. Some of this early music, also, was in all probability of a religious character, at least to the extent that Homer's work is religious; and we may remember in this connection that the work of Homer took much the same position among the Greeks as the Rig-Veda among the Indians, the Bible among the Jews and Christians, and the Koran among the Moslems. A question not without some degree of importance in considering the origins of music as an art, and of the origin of national music, arises here. This is as to how far it arose from the mere desire to produce pleasant sounds, how far it was an impulsive expression of ecstatic emotions, and how far it came from what Prof. Charles Picard has described as "an unconscious need—suggested, maybe by fear, maybe by sympathy —of fixing the magic and formidable influences of the gods or the dead." Certainly the use of music among the earliest Phrygian tribes, among the earliest organised people of the Western world, was largely a religious and therefore an eschatological one. Exactly what the relation of these earliest Phrygians was to the later tribe of the same name or to the Greeks generally is not clear. Of them, as of all the Greeks, and particularly of those of the classical period, it may be said that they

confondirent hardiment le beau et le bon; ils goutèrent l'art de façon sensuelle, parce qu'il excitait en eux l'illusion de la vie, et même, quelquefois (on le sait par les aventures de certaines statues) le trouble du désir. C'est vers la décadence seulement que la sagesse philosophique commençait à disserter sur l'esthétique, à une époque où l'on voit bien déjà que l'art ne créait plus guère de vrais chefs-d'œuvre. . . . À mesure qu'on pénètre l'originalité de l'art hellénique, en comprenant aussi l'importance des influences exercercées sur lui par le déhors, on se rend compte que le mérite souverain de la Grèce n'est pas tant d'avoir été une patrie d'idées nouvelles, que de parfaites techniques. Pour le raisonnement et les instruments de l'intelligence, plutôt qu'elle n'a

enrichi l'esprit lui-même. Dans l'art aussi, le "miracle grec" fut surtout la création d'une méthode. (Picard, La Sculpture Antique, Tome I).1

One brings in the whole of this long quotation here in order to give a definite starting-point to the discussion as to whom we mean by the Ancient Greeks. If we take Athens as the center of Greek culture, we may do so on the assumption that all the art, whether plastic, graphic or tonal, of that center was very strongly influenced by that of the surrounding tribes, so that to understand it, it is desirable we should know something of that which was exercised over a fairly large area outside Athens itself. One of the strongest of these influences was without question that of the Dorians, or as we generally know them from the name of their capital and only city, the Spartans. It is probable that the reason for this was the fact that at that period of the world's history fighting of necessity formed an important part of men's lives; that is, fighting with their fellowmen, either to acquire something better than they had or to defend their already acquired possessions, or fighting with the beasts in order to defend their lives and their homes. The Athenians were not by nature fighters. They were, as Clemenceau says, "Ioniens aux longs cheveux y affluent pour les recoulements de philosophie," but circumstances made it necessary they should take their share in the struggles of the world. The Spartans, on the other hand, were keen fighters, and their music was of a character likely to make good fighters.

Says Jardé, in his very suggestive work on La Formation du peuple grec:

C'est en Ionie que naissent l'art, la science, la littérature hellénique. Si l'Ionie s'est trouvée en avance sur le reste du monde grec, elle le doit au contact de civilisations plus anciennes. L'Ionie a beaucoup appris de l'Orient, mais elle en a transformé l'esprit pour faire vraiment œuvre grecque.<sup>2</sup>

1. . . boldly confounded the beautiful and the good; they enjoyed art in a sensuous manner, because it awoke in them the illusion of life, and even, at times (as we know from the adventures of certain statues) the disturbance of desire. It was only toward the decadence that philosophic wisdom began to discuss æsthetics, at an epoch when it was quite clear that art would no longer create any real master-works. . . . According as one discovers the originality of Hellenic art, while at the same time realising the importance of the influences exercised upon it from without, one sees that the sovereign merit of Greece is not so much that she was the natal land of new ideas, but of perfected techniques, of reason and the tools of the intelligence, rather than of the enrichment of the mind itself. In art as well, the "Greek miracle" was, above all, the creation of a method.

<sup>2</sup>It is in Ionia that Hellenic art, science and literature are born. If Ionia found herself in advance of the rest of the Greek world, it was due to her contact with more ancient civilisations. Ionia learned much from the Orient, yet she transformed the character of her acquisitions to make them truly Greek.

Not only did she acquire this from the older civilisations, however, but she acquired it also from the outposts of her own civilisations and from the barbarians whom her citizens so affected to despise. Let us see, then, what the Spartans, whose music was set up by the greatest musicians and the greatest philosophers of Athens as a model for the young Greek to copy, and as the only kind that was suitable for a healthy-minded youth to sing and play, and from which he was to acquire mental, moral and physical virility, was like.

The Dorians in historical times were a diminishing race, the native population of Sparta being reduced almost to the vanishing point. Yet so warlike were those who remained that when they were too few to form the armies necessary for the purposes of defending their own land and that of their conquered and conquering allies, they put into the field under the leadership of a few of themselves hordes of helots and mercenaries. No wonder, then, that physical culture was held in high honour, while intellectual culture was comparatively neglected. One form of culture. however, they could not afford to neglect; that is, the moral culture which comes from the use of music. "Les poèmes d'Homère, quelques chants guerriers, quelques poésies morales," were, as Jardé says, "a literary baggage sufficient for the soldier." It sounds very little, but with the means of learning available it was not so small as might be supposed. At the age of seven, the son of Spartan parents was placed at school (education was in the fullest sense of the term compulsory), where he would learn the business of life; in other words, all the art and science of war. Tyrtæus, an Athenian by birth but a Spartan by education and choice as well as by force of circumstances, was the poet and singer whose works were set as tasks, not to parse and analyse, but to learn by rote and to follow in their moral teaching. "It is fine to fall in the front rank as a brave man fighting for his country," was one of the sentiments impressed by these poems, and the strong Dorian melody to which the song was sung would help to drive home the force of the words on the mind of the young warrior-student.

That Tyrtæus was himself a lame schoolmaster and could do no fighting might with such people have been a deterrent to the choice of his works, but his story was as stirring as that of many a hero. At the time of the second war between the Spartans and the Messenians, so it was traditionally reported, the Oracle commanded the latter to take a leader from among the Athenians. But the Athenians, whatever their official relations with the

Spartans at the time, were actually not at all disposed to help. They therefore, in derision, sent as the divinely appointed leader the lame young pupil-teacher who had as yet won no reputation. And as so often happens, Fate overruled them, for by his songs and his personal encouragement Tyrtæus so inspired the Spartan soldiers that they fought with unexampled courage and so came off as victors. After this how could the Spartans do otherwise than give not only his art but his individual works an important place in the education of their youth.

So it came that music and dancing took leading places in the curriculum of the State schools, the dancing because it formed not only an excellent physical exercise, but also gave a sense of discipline and combined movement, the music because it would serve to enable the young soldier to understand the trumpetsignals, to sing his way to victory and to join in the pæans when "The Muses had a sanctuary at Sparta, this was achieved. because music and singing had their place in the life of the soldier. The hoplites (heavily armed foot soldiers) advanced to the combat to the song of flutes, of lyres and of cithers; they thanked the Gods of Victory by intoning the pean. Choral singing embellished the feasts of the city; at the feast of the Gymnopædiæ. of which the fame attracted many strangers, the Lacedemonian youth executed songs and dances in honour of Apollo. If Sparta has not given birth to poets, she has gladly gathered those who. coming from outside, took their share in her public life; Terpander of Lesbos, Tyrtæus of Athens, Thaletas of Crete, Alcman of Sardes, became the national poets of the city which adopted them."

That music had for the Spartans and for the other Greek tribes the same attractive powers as it has for the rest of the world to-day, when the surest way of getting all classes together is to send round the streets a military band or even single players, is evident from the various uses to which it was put for military and civil signalling. It is commonly said, and there is little reason to doubt it even if the circumstantial evidence in favour of the statement is not strong, that at one time the use of the trumpet for marches, particularly before a fight, was forbidden on the ground that it roused the frenzy of the soldiers to such an extent as to make them too venturesome and too little self-controlled, and that in place of it the flute (or pan-pipes) was used, by which means the men were both inspired to valour and restrained from rash action. Yet the trumpet, as its carrying power on the battlefield was much greater and its call more decisive, was used

for signalling. In other cases of urgency the trumpet was used not only on the battlefield, but in the towns to call the people together. The great earthquake of 464 B.C., when twenty thousand people lost their lives, might, according to some authorities, have had much more serious results had it not been for the presence of mind of the King, Archidamos II (he later led the Dorians against the Ionians and conquered Athens), who ordered trumpets to be sounded so that all the people assembled in one place outside the city of Sparta. The fact that other authorities consider this action on the part of the King to have been a mistake, and say that it was one of the causes which made the loss of life so great, rather than a means of keeping it within limits, does not alter the interest from the point of view of the musician, which arises from the fact that a musical instrument was regarded as the most effective means of calling the people out of their houses whether to save their lives or to lose them is, at this distance of time, a matter of indifference.

These were the people whose warlike prowess united all Greece. It was not until, first by martial methods and then by their superior force of character, they had thoroughly conquered the other tribes of the Levant, that Greek art developed in such a manner as to become a great world-art. Previously the influence of the Ionians had been fairly strong, but their conquest by the Persians reduced their strength so greatly as almost to bring it to an end. The Arcadians were too isolated in their separate cantons to have any great influence; the Lydians were semi-orientals who, although they had lost much of the masculine qualities of their Dorian cousins, possessed, as a result of their Eastern relationships, a culture which though fine was of an entirely unaggressive nature. In spite of the fact that by origin most of the citizens were Ionians by long descent, Heredotus tells us they "blushed" to be given that name. Yet if their shame was not entirely uncalled for, neither was it completely justified, and, by the time of Thucydides they had realised this and had become more or less proud of the name.

The subtlety of the Athenians arose, in fact, as much from the philosophic effeminacy of the Ionians, which enabled them to develop theoretically and practically the music and other arts of the neighbouring tribes, and to combine them in a complete entity, as from the physical energy and virility of the Spartans. Such development and unification certainly owed little to the stolidity of their nearest neighbors, the Boetian boers. Also, if the Ionians were effeminate, they gave a high place in their artistic culture to

women, and it was to them that the musical activity of the Greek women was chiefly to be attributed. Woman was the personification of virtue and beauty, two terms that to the Greeks were almost synonymous. She was also, however, an active partner in the creation of what was beautiful, and, after the primary duty of the procreation of the species of which she was the most beautiful example, particularly of what was beautiful in sound. The Æolians, among whom musical culture took a place inferior to that which it took among the Ionians, held women in less honour. Sappho was an Ionian, and her influence as a musician was not only of an unquestionably high character, but it became very widespread largely through the activities of her girl pupils, who "Much importance came from all parts of the Greek Empire. was attached to the musical formation of the girls," says Professor Hillen, in his handbook on Greek Culture; "for they often, just as did the boys, appeared in festival choruses and in the choruses of the dramas." Alcman, the greatest of the adopted poets of Sparta, who sang "but as the birds sing," wrote a number of choruses for girls' voices, and on occasion he danced in front of a procession of girls, playing the lyre to accompany their voices.

This is not surprising when we remember that among all the Greek tribes, and right through their history, music formed one of the chief occupations of the women in their homes. At the times when and in the places where they were isolated in seraglios, they occupied themselves with ordering the domestic conditions, with needlework, with beautifying themselves so as to make their appearance attractive to their husbands in accordance with the moral principles with which from childhood they were imbued, in playing the cither and in singing songs. Even in the palmiest days of Athens as the metropolis of art and philosophy, the household conditions made the practice of music among women a means of relieving the monotony of their lives, and, incidentally, of acquiring from the ballads and odes such a knowledge of history and moral philosophy as would enable them to take their proper share in the education of the girls and of the boys who were not yet of an age to attend the rigourous schools where they were trained to the arduous, or supposedly arduous, duties of citizen-The husband and father was out much of the day, either controlling the work of the serfs who did his trading or worked in his fields, the rougher work of the house being done by women serfs, or in disputing with his friends or listening to the orations of the philosophers. As items of the furniture would be a lyre, a

cither, or other standing instrument and, possibly, a reed instrument or a set of pan-pipes hanging on the wall. Reading scarcely existed, except among those who were themselves authors and who read or sang their compositions in public. From these, or from her own mother and women teachers, the young woman learnt the songs suited to her position in life, and when the work of distributing their tasks to the household servants, and of beautifying herself with draperies and cosmetics was finished, the only thing to do was to talk to the other women who might, as members of the family, be living with her or be paying her a visit, and to the children, and to sing these songs to the accompaniment of one or other of the musical instruments. By this means a tradition of ballad music and ballad history was handed down, free from any impurities that might otherwise be brought in from the street or the public places.

Not that the musical influence of the women was always a good one. When they began to sing and play for the pleasure of their husbands rather than for their own pleasure and moral development, their art began to deteriorate, and still more did it lose its moral and artistic position when some of them joined in providing music for the men's symposiums, or clubs, which met in the taverns for discussion and relaxation. These symposiums had originally a character that was in a certain measure intellectual. After dinner the men would meet to discuss the events and problems of the day, to invent, propound and answer enigmas of varied character and standards, and to sing songs, often of a political or satirical character. These Meliboean songs in time became debased, wanton songs sung as solos made their appearance, sword-dancers, male and female, acrobats and jesters, were invited to assist those who were unable to provide their own entertainment, and women flute-players of more than doubtful reputation shared with strong drink the task of making the hearts of their members merry. On the other hand, a few such gatherings maintained their original high standard, and became great centers of artistic and scientific discussions in which the subject of music took a not unimportant place.

In other ways the musical life of the ancient Greeks had much in common with our own, and at least in one respect it set a good example for that of our own days. Not only amongst the warlike Spartans, but in Athens itself, music formed an important item in the educational curriculum of the children and young people, and the music-masters had the same disciplinary powers, the same authority to inflict punishment and to confer rewards,

as the teachers of other subjects. The training of professional musicians was chiefly traditional and aural, but it was thorough, while their general education was wide, for they had to have a knowledge of other arts and of life itself, so that in their often improvised songs they could represent the life of their own day or the history of the past. As is the case to-day among the Western nations, most of them became teachers in the official schools or founded schools of their own, though some few devoted themselves chiefly, if not entirely, to performing and composing. Artists, singers and instrumentalists of various kinds, travelled to the many Greek colonies which stretched from one end of the Mediterranean to the other, giving recitals either on their own initiative or at the invitation of patrons or societies who engaged them for the purpose. That some of such recitals were given in the open-air theaters or even in the market-places and streets does not mean that the artists were in the slightest degree what we should now call street-singers; often they were the finest and most famous artists, but the climate and the conditions of life generally lent themselves to al fresco performances, so that concerthalls did not exist.

Like those of professional artists of to-day, these travels served the purpose rather of spreading and continuing a knowledge of standard and successful works of the metropolis than of gathering any new ideas from the places visited. It is even questionable whether, in matters of art, the Greek colonies were not more dependent upon the Mother Country and its social centers than are those of modern empires, for these colonies were merely trading settlements at the mouths of the rivers, and their populations regarded the people with whom they were sent to trade as barbarians who had no art of their own and from whom they could learn nothing. Some of the larger colonies had their own theaters, but the dramas and other ceremonies were exclusively repetitions and imitations of those at Athens.

While most Greek drama was in the nature of what we should now call opera, some of it was rather a predecessor of oratorio, and even of cantata. A number of works discovered have little literary value, their chief claim to attention being that the words are such as can be sung easily and distinctly with an even rhythmic movement. The actor was always a singer and some, like Æschylus, combined in themselves the qualities of poet, actor, stagemanager and composer. "The tragedies," it has been said, "arose out of the music, and not the music out of the tragedies." While in course of time, however, the music of the chorus in the tragedies

gradually decreased in importance, in the Dithyrambs—the great Dyonisian feasts of which dancing formed a very important feature—it eventually took the leading position, so that something in the same nature as our great choirs and choral societies came into existence.

It was in these feasts also that the early instances of what we now know as community singing took place, though the method of such mass performances was entirely different from that of to-day. Whether these continued beyond the earliest times or not it is difficult to say, for we know that in some cases the place of the general body of worshippers or feast-makers was gradually taken by trained choirs. In the beginning the form or structure of the songs was their one continuing factor, for the songs themselves were extemporised by the leader, whose poetic and musical frenzy was aided by ample libations. As he sang the people responded in more or less the same words and the same melody (the variations arising from the lack of ability of the ordinary person to repeat exactly what he has just heard), so that in time the Circular Hymn, a rudimentary Dithyramb, was developed.

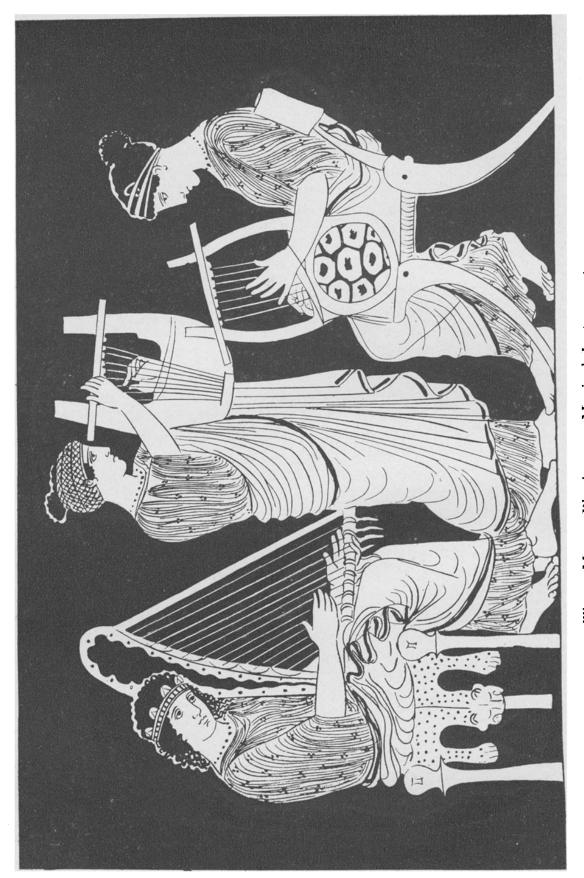
Sport as an occasion for community singing, as it is now practised at football matches, is also a matter of combined knowledge and conjecture, the dividing line of which is vague and uncertain. As has been said of the Spartans alone, so also we may say of the whole of the Greek people; music had an organised part in the Games. There were, certainly, in course of time, the "agogee," or musical competitions which comprised playing on the flute and cither, singing and recitation, with or without accompaniment. From the smaller and more miscellaneous of these competitions gradually arose the dramatic competitions for which the most famous dramas were written, with the declamation and vocal and instrumental music that belonged to them. The victors' songs at the Games were sometimes spontaneous and even extempore, and sometimes either traditional songs or songs specially written by some official or popular artist.

With all this official music of various types and characters, and with the love of the Greek for the sound of his own voice, it is difficult to think that the crowd of onlookers did not, in an organised or unorganised manner, claim its share and join lustily in some of the odes or ditties with which it was familiar. Such an occasion, when practically the whole of the population was present, afforded Solon (and probably his successors) an opportunity of singing, in the form of elementary verses, the new laws which he had formulated, and Thognis put his rules of life into

the same form, so that they were sung to the accompaniment of the flute, though whether by official singers alone or by the general public we do not know. "Under the plane trees of the Altis which bordered on the Olympic stadium," says Monceau in La Grèce avant Alexandre, "all the sons of Hellas joined, in a motley of costumes and of dialects, in one and the same conception of religion, of social life, of the common Fatherland, of art and of life," and here whatever there was of music, from the most popular to the most esoteric, found its outlet on these occasions.

One other important musical custom, in which the women had a large share and which has had a great influence on all subsequent tonal art, was that of wailing or keening. This is one of the customs that Greece had in common with other nations of the time, and while we find it among the Jews and the Egyptians it has also been continued in one form or another right down to the present time among the Irish and some other small nations. This was not unassociated with the music of the Temple which, as a rule, was directly concerned with the spirits of the departed, for the hero-worship, the worship of gods and demi-gods who were more than half human, in which the Greeks sought to come into touch with the Eternal, was in its nature very near akin to ancestor-worship. And it was essential that music should form a part of the various services. Not only were the regular and frequent sacrifices accompanied by rites in which the recitation of words and the rhythmic movements of the body were combined with the music of the flute or reed instrument, but the solemn annual consecration of the temple was performed in much the same way, the whole of the words being recited to the sound of the flute. The flute-player was, in fact, second only in importance to the priest, and wore similar vestments suggestive of the great dignity of his office and of his personal purity. Keening, on the other hand, was a custom practised in the household immediately after death, and while the temple flute-player, or a flute-player unattached to the temple, and often a much less desirable person from the point of view alike of morality and of social qualities, had his place in it, much of it was indulged in by members of the family or by professional keeners who not only sang dirges but made horrible noises expressive of the sorrow of relations and friends at the loss of the deceased. It is not unlikely, also, that the female voices engaged in singing dirges were accompanied by cithers, though this is by no means certain.

Whatever be the truth on this point, however, it is clear that professional and amateur joined in musical performances on all



Three Muses Playing on Musical Instruments From a Greek Vase

solemn occasions, and that the Greek women, far from being entirely silent at home and in public, bore a considerable share in the making of public and private music. In fact, the more one studies the life of the Greeks at all periods of their history, the more evident does it become that their use of music in all departments of their lives was much the same as ours. They had instruments of less power and range than our own, their harmonic and instrumental technic was more limited, but their ideas of the necessary or desirable immanence of music were the same.

More elementary than that of the temple and the theater, in all probability, was the music that accompanied nearly all the work done by both men and women. Even in this, as I have pointed out previously (The Undulations of Technique, The Musi-CAL QUARTERLY, January, 1929), the regular, unvarying rhythm that binds activity and music together, there is a certain and often highly developed technic. The melodies themselves, were, no doubt, of the same character as the simpler chanties of seamen and landworkers in recent centuries the world over, with even a greater degree of monotony. Yet we find records of not only vocal accompaniment to the loom and spinning-wheel, but of flute accompaniment to bread-making, of flute and voice combined to the work of mowing, grinding and treading the corn, and preparing other foodstuffs, the pumping and carrying of water, as well as (it goes almost without saying) rowing by slaves and freemen, and hauling. As music and drama were inseparable, and as drama, in spite of its artificialities and conventionalities, was a reflex of the life of the time, so music and life were equally inseparable. How far the music of such activity was affected by, and how far it affected, art music we cannot now say. literary remains, from Homer onwards, however, we know that there was some mutual and reflex influence, so that whether we turn to the life of the artists and art-lovers, to that of the wealthy patrons and their dependent minstrels, to the houses of the bourgeois whose moderate means made the indulgence in art matters a personal one, or to the physical labourer (one does not say the manual labourer, for his work was more often than not done with the whole of his body) whose sole object was the lightening of his heavy tasks, we find from top to bottom of society and in all the various tribes which made up the nation, a musical activity that equalled, if it did not greatly exceed, that of the most musical nations of modern history.



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#### THE HERITAGE OF GREECE IN MUSIC.

By WILFRID PERRETT, PH.D.,

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THE only professor of Greek I have ever known who was also a musician always refused on principle to give me any help with a stiff passage from a Greek author on music. His reply was always the same: "Put that stuff away. Nobody has ever made head or tail of Greek music, and nobody ever That way madness lies." It was in vain I promised to become a harmless lunatic. I respect his opinion, and my own. Among what looks like a heap of lumber two things have taken my fancy and engaged my attention at intervals during a lengthy period consisting mainly of interruptions. One thing is the way the Pythagoreans had of defining musical intervals by ratios. Their methods can be much improved and simplified by means of two tools of British invention: logarithms and tuning-forks. The other thing is the tradition, not altogether vague, of "the genuine and beautiful Greek music," the lost enharmonic genus. These two in combination promise something of great value for the future of music. Î am not going back to what we have already inherited from Greece, to Boethius and medieval music or even to Zarlino and the renaissance. That tale has been told. I am not convinced that there is anything in the heritage of Greece in music now worth troubling about beyond the two things mentioned. This without prejudice to what others may find in that same lumber-room. That a phonetician should meddle with music ought not to occasion surprise. Many of our leading phoneticians have done so:— Wallis, Holder, Thomas Young, Willis, Wheatstone, Ellis. It is in the English tradition. So much by way of apology.

This paper is intended as a supplement to the work of A. J. Ellis. It may be news to some of those present that

his tonometrical investigations into the Musical Scales of Various Nations, in collaboration with A. J. Hipkins ("the two A.J.'s," a wonderfully strong partnership lasting fourteen years, 1876-1890), published in 1885, is translated into German in Vol. I of Sammelbände für Musikwissenschaft, 1922, and is now regarded as a classic in the German schools of musicology. In every German university there is now a chair of Musikwissenschaft (musicology), a luxury which we in England apparently cannot afford. Ellis's system of logarithmic cents, a linear measure for musical intervals as handy as a two-foot rule, is in constant use wherever these problems are effectively studied.

The application of Ellis's cents enables us to prove, once for all, that Aristoxenos did not divide the octave into twelve equal semitones. His theory divides the just fourth into 30 equal parts, and certainly postulates equal semitones. But twelve of his equal semitones do not make an octave. They amount to 1,195·308c. instead of 1,200c. Now the octave is the one and only interval on the piano, organ, etc., that must be tuned true to its ratio, 1:2. With one exception the octave tested by Ellis on seven keyboard instruments in equal temperament was not more than one cent sharp or flat. The error of 1c., if not allowed to accumulate, may be neglected. It is not perceptible melodically to the finest ear under the most favourable conditions. But what would you say of a tuner who left every octave nearer five than four cents flat?

If we wish to find an anticipation of equal temperament we must turn, not to Greece, but to China, where about 1595 Prince Tsai-yu somehow contrived to work out the ratio of our equal semitone,  $1: \sqrt[13]{2}$  with altogether excessive exactitude. How he did this is not clear. He does not show the working. But he got the answer all right, very much so: a fraction which may be written 1.059,463,094 etc. to fifteen more places of decimals (Maurice Courant in Lavignac, I, 91).

As a mathematician, Aristoxenos was not a success. His one attempt at exact measurement with the monochord (ed. Macran, 56, 57), where he tried to prove that a just fourth is made up of two major tones and a half, made him the laughing-stock of the more narrow-minded of the Pythagoreans, and gave rise to the bad joke about hemitonos, a semitone, and hemionos, a semi-ass, meaning a mule. It is a pity, because on the æsthetic side he is unsurpassed. His

conception of good singing—no "wobble," no singing off pitch, no slurring or scooping, as little vibrato as possible—is admirable in its austerity. Helmholtz and Ellis call the ditone, made up of two major tones (64:81, 408c.) the Pythagorean major third. It should, surely, be called the Aristoxenian major third; Aristoxenos measures off the two major tones before our eyes.

As to Hipkins: after some forty years the assertion that piano-makers cause the hammer to strike the string at a point which eliminates the 7th harmonic, repeated as scientific fact by innumerable writers, is degraded to a false hypothesis in Vol. VIII of Geiger & Scheel, Handbuch der Physik, 1927, p. 187. Professor Kalähne should have given the reference to two papers in the Proceedings of the Royal Society, 1885, in which Hipkins, who was Broadwood's expert, showed that the observations of Helmholtz on this point were erroneous in every respect. About twenty years ago I used to listen to a bass string in every good piano I could come across. The 7th harmonic is one of the most prominent. It can invariably be detected by the beats which it makes with the minor seventh three octaves above.

Among the various nations considered by Ellis, the ancient Greeks come badly off. Ellis had no first-hand knowledge of the Greek authors on music. He placed all his confidence in the much over-rated authority of Helmholtz. It is as Hipkins admitted in 1902: they had both of them been content to follow the too easy tabulation of Helmholtz. After Ellis's death in 1890 Hipkins devoted all his scanty leisure to the study of Greek music, and was certainly well away when he found it essential to "appreciate septimal intervals-the ratios 7:8, 6:7, and also 4:7—and to regard scales rather in descending than in ascending order." I find, too, among his MS. notes that he had booked the diesis of Archytas, 28:27, 63c., perhaps the most striking omission in Ellis's table of over 150 intervals less than an octave. This interval has been repeatedly singled out for condemnation as irrational, without any attempt whatever at experimental proof. For example, on p. 153 of Weil & Reinach's quite indispensable edition of Plutarch De Musica we are told that the intervals of the tense diatonic tetrachord of Archytas and of the lax diatonic recorded by Ptolemy are tout à fait irrationnels. This instrument, the Olympion, proves the contrary. Ptolemy accepted the diesis of Archytas only as a chromatic semitone. According to him it was too small for the diatonic genus and too big for the enharmonic. Archytas himself, however, employed it both as a semitone and as a quarter-tone, and this throws a flood-light on the function of small intervals and small differences between intervals. When you cross a stream on stepping-stones, there may be long steps and short steps, but you do not trouble about the exact size of the steps; the essential thing is to step from one firm foothold to another.

Archytas of Tarentum was a contemporary and friend of Plato, whose life he once saved. He was a distinguished statesman, general, inventor and engineer. The poet Horace in one of his most moving odes (I, 28) recalls Archytas as the great mathematician who could measure land and sea, and set a number to the seeming infinity of grains of sand. Yet all his attainments and achievements were powerless against death:

ncc quicquam tibi prodest Aërias tentasse domos, animoque rotundum Percurrisse polum, morituro.

But numbers cannot fail. When Archytas wrote down the ratios of the enharmonic tetrachord in the Dorian mode at Phrygian pitch (G down to D), he too wrought a monument more durable than bronze.

Archytas has had to wait twenty-two centuries for his vindication as a musician. The harmony latent in his ratios was revealed for the first time at the Royal Institution last November. I shall now ask you to listen to the supposedly irrational interval 28:27.... In that passage I have brought in two tetrachords containing the diesis of Archytas, a chromatic, and a lax diatonic. I will now sound four such tetrachords melodically, two of them authentic, two inferred, in this order: tense diatonic, lax diatonic, chromatic, enharmonic; and will harmonise the last one...

What Helmholtz and Ellis call the Old Chromatic either was or became unknown in Ancient Greece. Our chromatic semitone, 24:25, 70c. was first introduced by Didymus, a Pythagorean living in Rome in the time of Nero. It was rejected by Ptolemy as quite unsingable, quite out of tune. Helmholtz, through some strange confusion, ascribed the chromatic tetrachord of Didymus to Eratosthenes, 250 years earlier. How such a blunder can have remained unchallenged by two generations of musicians is beyond my comprehension. We know nothing of the tetrachords of Didymus and Eratosthenes except what Ptolemy the astronomer tells us.

Writing in Alexandria before the destruction of the library, he had access to many books now lost. There was no good edition of his invaluable work on *Harmonics* until that of Wallis, 1682. There has been no edition at all of Ptolemy's *Harmonics* between that of Wallis, 1699, and the recent one by a Swedish scholar, Ingemar Düring, 1930.

Our chromatic semitone, rejected by Ptolemy, is of course precisely the interval by which in just intonation we pass from the minor third to the major third, or from the minor sixth to the major sixth. It is the very foundation of tertian harmony, the major-minor system in which all our classical music is composed. It is the use of this interval that developed our sense of tonality, something which is only rudimentary in the Greek scales, and decided our choice in favour of the Lydian mode for our diatonic scale in preference to the national Greek Dorian mode (descending from E to E) or any other mode. This does not mean that the Greeks had not the major triad and the minor triad. On the contrary, among those "most ancient" enharmonic scales given by Aristides Quintilianus (Meibom, p. 22) there is the Iastian with the major triad F, A, C on successive notes, and four of the seven notes of the Syntonolydian enharmonic are F, A, C, E in that order. But they do not appear to have had, in any scale, major and minor triads from the same tonic. By rejecting the 24: 25 semitone Ptolemy condemned the whole major-minor system which was finally, on the clavichord of Johann Sebastian Bach, to be established on twelve key-notes to the octave. We may say, without doing Ptolemy any injustice, that he did not know what he was talking about.

On the other hand, Pole in his *Philosophy of Music*, p. 244, says that if voices were singing the full major chord, the substitution of the harmonic seventh for the dominant seventh "would not do at all; it would be unsingable," whereas Ellis maintained—what is self-evident with properly tuned reeds—that the harmonic seventh is the sole justification for the far harsher chord of the dominant seventh. If Ptolemy and Pole were both right, it is a wonder that we can sing anything beyond the plain diatonic. But they were both wrong. Just as Aristoxenos in his theorem became entangled in the Greek tempered scale with ditone and limma, so Pole was unable to free himself from the ambiguities of equal temperament, which substitutes e.g. in the key of C, one compromise Bb, 1,000c., for three distinct notes, 'kBb, 4:7, 969c., kBb, 9:16, 996c., and Bb, 5:9, 1,018c., all three of

which are harmonically related to the key-note. Pole's table on p. 222 showing the same degree of roughness for 5:6. 5: 9, and the tritone, the diabolic interval, 32: 45, proves that he too did not know what he was talking about. Pole can never have had an opportunity to submit this estimate to the test of exact experiment. If there is not too much noise, it is possible to attempt an analysis of the repulsive combination Mi contra Fa, best taken for the purpose in the twice-accented octave. The reeds f'', b'' sounding together produce two Tartini tones, making an interval somewhere between the fourth and the fifth. The ear is not able to define them much more closely than that. They are irrational. But a simple calculation shows that the full discord is as 13:19:32:45, and a reference to Ellis's Table and a little patience give 657c. as the equivalent of 13:19. So now we know that F sustained or remembered against B produces two more notes, heard or under-heard, which together make an impossible Fifth, 45c. or a quarter of a minor tone flat. Dr. Burney knew what Shakespeare meant by Fa,—Sol, La, Me (this is the correct reading of the First Folio, with a dash after Fa) in King Lear, I, ii, 129. Chappell did not know. Wright and subsequent editors do not know.

Now is it creditable that Palestrina intended his singers to intone F against B (G, D) in the example quoted by Pole, p. 189? I simply cannot believe it. This seventh of Palestrina and Monteverde is not, as Pole would have it, the dominant seventh, 9:16. It is the harmonic seventh, 4:7. The singer would instinctively flatten the note written F (musica ficta) by a septimal comma, just as Olympos flattened F on his Phrygian flute (he could not have sharpened B, because the four invariable notes in the Dorian mode were fixed by the ratio, in Aristotle and everywhere else as far as I know, 6:8:9:12 for E, A, B, E).

Let me now explain that this experimental harmonium which I have called the Olympion gives, firstly, the diatonic scales of C major and C minor in as nearly just intonation as the conditions allow. With two variables, pressure and temperature, it is and always has been impossible to make perfect tuning permament. With the thermostat, the electric fans and the delicate anemometers of our unsurpassed organbuilders (see Reginald Whitworth, The Electric Organ, 1930), it is by no means impossible. The grand organ of the future will be played under laboratory conditions. With these two scales is combined the minor scale in the key of septimal Bb, that is, the harmonic seventh of C, which was

the Mese or middle note of the new diatonic found by Olympos the Phrygian flute player of about 650 B.C., to whom the discovery of the enharmonic genus is ascribed. Two more notes, giving the major third and major sixth from the septimal key-note, make up a total of twenty notes to the octave from C to C inclusive. Thus the combined scale embodies the advice given by Dr. Wallis to the Rev. Thos. Salmon, rector of Mepsal, in 1688.

# 40 Dr. Wallis's Remarks on the

Sixth.) In like manner, if I would, from C, rise a Fourth to F, at two near-equal steps, (as when we rise an Eighth by a Fisth and Fourth; or a Fisth, by greater and lesser Third;) that is, if I would divide the Proportion of 3 to 4, or 6 to 8, into two near-equals; those are to be 6 to 7, and 7 to 8: And therefore CD\* as 6 to 7, and D\* F as 7 to 8, (whatever chance thereby to be the division of DE.) And the like for other cases. So that for instance, the same D\* or F\*, as to disferent purposes, shall signific differently. And such Arts we must make use of, if we would revive the Greeks Chromatick and Enarmonick Musick. But the Speculation is too nice for most of our present Practisers.

It has Wallis's harmonic division of the fourths C to F, D to G, Eb to Ab, E to A, G to C, Bb to Eb, and B to E. But F to Bb and A to D are acute fourths (20:27) a comma too wide, and cannot be treated in this way. This is the secret of the lost enharmonic which Tartini the violinist discovered in 1754, that it did not shift the comma or temper the natural intervals of the diatonic scale. It kept the comma in its place and supplemented tertian by septimal harmony. Please do not misunderstand me at this point. There is no evidence whatever that the Greeks ever employed more than two sustained notes at the same time. The only instrument that would do even this was the double pipe or Phrygian flute. We are at liberty to assume, if we wish, that they played arpeggios while a deeper note was sounding. If, as we may gather from Giraldus Cambrensis, the Welsh harpers in the twelfth century knew how to do this (sub obtuso grossioris chordae sonitu, gracilium tinnitus licentius ludunt, etc.), why not the ancient Greeks? The fact that Plato refused to admit into his ideal Republic "the artificers of etc.), why not the ancient Greeks? lyres . . . with complex scales, or of any other many-stringed and curiously-harmonised instruments" shows that such instruments and instrument-makers were not unheard of. And as Thomas Young remarked, an arpeggio is virtually an accord.

There is ample evidence for two notes. Plutarch quotes examples of two notes sounding together on the Phrygian flute, making intervals of the fifth, fourth, major third, minor third, and major tone, in all examples but one the accompaniment (crusis) being above the melody (melos). But to some persons two sustained notes may mean either three notes or four notes. Tartini was one of these, Joachim was another, the late Sir Thomas Wrightson was another. It is on record that all three employed septimal intervals in their double-Olympos, 2,400 years before Tartini, was in the best possible position to hear Tartini tones. Ellis pointed out long ago that the best way to hear them is to play on two flageolets at once. It is then impossible for the performer to escape them unless his ear is strangely obtuse. I myself was puzzled and disgusted by grossly discordant Tartini tones from a toy dulcimer at the age of six or seven—before I had learned to read. My friend R.S., at the age of two years and three days, showed me a novel and ingenious way of cutting out the fierce resultant tones from a gramophone in a small room. He flapped the auricle over the meatus, and holding it down airtight with two fingers and a thumb, demanded more "mooky," which rhymed with bookie and meant music, for three-quarters of an hour. I am still puzzled by the accepted theory of resultant tones, which no doubt corresponds to something in abstract physical science, but does not correspond to or explain what the ear can perceive. Has anyone yet heard a summation tone? I never have, though goodness knows I've had chances enough in the past three years trying to make the squealing overtones of these brass reeds scream in concord. Sir Thomas Wrightson told me he had never heard summation tones, though his theory of the internal ear accounts for them, and they have accounted for his theory (but his dead beat hypothesis remains, and awaits a better superstructure). I think we shall return some day to the beat-tone hypothesis of Serre (1753), accepted by Lagrange and developed by Thomas Young, who was the first to show, about 1800, that it is possible to hear two Tartini tones at the same time. Ellis and Pole did not know this, and it detracts somewhat from the value of their work. In tuning a concord of reeds one should judge finally, not negatively by the absence of beats, but positively by the fullness and roundness of the lovely undertones: and if the concord 5:6:7:8:10 from middle C finally sounds less smooth than 4:5:6:8, there is something wrong. I never realised how few persons are able to detect these undertones (Tartini tones) until I tried to demonstrate the enharmonic system of Olympos before the Philological Society in 1928 by means of an octave of twenty tuning-forks, when I found to my dismay that in most cases the demonstration was a complete failure. Hence the necessity for the present instrument, to bring out the latent harmony.

For example, these two tuning-forks give Tartini's substitute for the tritone 32: 45 in the ascending scale from C. Their ratio is 5:7, which is the inversion of 10:7, found, as I infer, by Olympos as a substitute for the tritone down from B to F (45:32) in the Greek descending scale from E. (Some years ago I asked the Greek Metropolitan Germanos to sing me the diatonic scale. He most obligingly responded at once with a descending scale: tone, tone, semitone, tone, tone, tone, semitone. That is the ancient Greek national scale in the Dorian mode and diatonic genus.) The resultant tones from these two forks may be inaudible. They form a just Fifth, Ab—Eb. On the harmonium the accord 2:3:5:7 with middle C as 5 should be heard as a perfectly smooth concord. This is the true form of the accord known as the German Sixth. According to Helmholtz (p. 228) "the scales of modern music cannot possibly accept tones determined by the number 7," a truly colossal blunder. As an example of the irony of things, this would be hard to beat: that after all his labours in the cause of what he conceived to be just intonation, Helmholtz denied the ideal existence of the German Sixth.

The first question to ask of any scheme for just intonation is, does it contain the interval 5:7 from each key-note? If not, it is useless. Another indispensable interval is 10:7 down from the major seventh in each key. This slide shows a scheme with 61 notes to the octave published last year. Further experiment has convinced me that this scheme is also incomplete. With each substantive key-note we must have the 17th harmonic found by Ellis to give the true form of the accords of the minor seventh and ninth, (8):10:12:14:17. Even then we should be well within the limit of Bosanquet's symmetrical keyboard (Slide) in the Science Museum at South Kensington, with 84 digitals to the octave, said to be easier to play than the piano, because with no matter what change of key the fingering remains the same. But the arrangement would have to be different.

I am sorry I cannot illustrate septendecimal harmony on this instrument as it is now tuned. It does not go beyond septimal harmony. I have been asked if I can play a tune on it. It is rather difficult to find one, because while it has three flats, it has no sharps, and it is quite impossible to play D with F or A, or F with B or Bb, but I will now ask you to listen to a septimal version of Tallis's Canon, first in F, then in C, with some "lost chords."...

The upper register of reeds has a distressing pennytrumpet quality of tone, and I have never yet succeeded in getting it into satisfactory tune. Nobody in England now makes harmonium reeds. It is one of our minor industries that have quite gone under. (Organ-reeds are a different proposition.) And since the death of Mr. William Humphreys I know of no one who has the knack of voicing harmonium reeds. You must have noticed the unevenness here. A maker of steel concertina reeds, which I don't want —they seem to me still more cutting and blatant than brass tells me that my brass reeds are very poor specimens. That may be; but if nobody in the country can provide what you need, you have to put up with what you can get from abroad. While on the subject of reeds may I add a note to pp. 120, 125 of my book, which may be misleading. Invar has no co-efficient of expansion, but its elasticity varies with temperature. Elinvar on the contrary has a constant modulus of elasticity over an ample range of temperature, and it would be worth while to experiment with it. Such specimens of these alloys as I have seen, as yet, are altogether too inelastic. This strip, you see, when I bend it, stays bent. [Mr. R. W. Western, who was present when this paper was read, very kindly informs me, on the authority of Professor Boys, that admirable watch-springs have been made of elinvar, which should therefore be suitable for reeds.]

With the harmonically divided fourths we get closer harmony than is possible on our keyboard instruments. Listen to 6:7:8, 5:6:7,7:8:10, etc., in this sequence...; 9:10:14 in this one... These are not discords. The melodic interval Eb to 'F, 32:35, 155c. may look irrational on paper, but did not sound so as I have just played it in the series Bb 6:7:8, B 5:6:7, etc. If it is true that "we have no experience of septimal harmony," that is not the fault of A. J. Ellis, but the confession implies that we cannot appreciate fine chamber-music when we hear it. Professor Max F. Meyer, who, by the way, was first in the field with an equal quarter-tone pianoforte (Slide) in 1902, wrote to me

from Columbia, Mo., in 1930: "It is very agreeable news to me that someone else, too, has the conviction that the intervals whose terms include 7, play, and have played, a larger rôle in music than is usually imagined."

Septimal intervals are quite possible on a perfect instrument as defined by Dr. Robert Smith, 1769: "By a perfect instrument I mean a voice, violin, violoncello, etc., with which a good musician can perfectly express any sound

which his ear requires."

A well-known violinist, a neighbour of mine, who is also a good musician in Dr. Smith's sense when he wants to be or is permitted to be, having ten minutes to spare one day, consented to be used as a Versuchstier. I asked him to repeat the melody of ... in which the harmonic seventh of Ab has to change to a note which is not on this harmonium, namely, the leading note to G. He performed this feat perfectly and without hesitation, not by shifting the finger on the string, but by "pressing a little harder." showed himself able to appreciate and render, under harmonic guidance, the difference between 583c. and 590c. Why should he not, being given C and B by the reeds? It was merely a case of raising the "Gb," the Tartini interval from C, to "F#," the fifth from B. The exact difference is in vibrations 1.62, and in cents 7.712, or one twenty-sixth part of a tone on the piano, but of course he did not know Why should he? It seems to follow that sharps and flats for chamber music are like the medieval neumes: unless you know what they stand for, you cannot tell.

If I sound this mistuned fifth (695 instead of 702c.) on the harmonium . . . you cannot fail to hear the loud knocking of the lowest series of beats. They come at the rate of thirteen in four seconds. Beats are noise, and if the energy that should go into the production of tone is wasted in producing noise, the tonal quality of the whole instrument is impaired. This interval of approximately 7c., making all the difference between happiness and misery, recurs so frequently that I decided to see what would happen, on paper, if the octave were divided into 171 equal parts. I have worked it out, and find that this new cycle contains all the intervals of quintal, tertian, septimal, and septendecimal harmony to within 1c. The claim may therefore be made that the cycle of 171 represents the perfect musical scale.

Slide. Thomas Young on Tartini tones. The handwriting on a bookmark found at this page is Faraday's. Young's clue being followed up leads to a chromatic scale with one

extra note, between A, 884c. and Bb, 1,018c. I have dealt with this in Chapter VI, but would like to add that the alternative route, from A, 884c. over kBb, 996c. is much easier to find than I thought. All that is necessary is to have F as well as C in mind. The division of the 134c. semitone was also found by Tartini, and occurs frequently in the Orestes fragment. Listen to this chromatic scale. Where does the extra note come in? . . . first melodically, then . . . in septimal harmony. [What the unhappy reader is to make of all these lacunæ I really do not know. Hamlet without the Prince of Denmark is beaten to a standstill. Some means of appealing directly to the ear must be found. A gramophone record possibly.]

Slide. The passage found only in Plutarch in which Aristoxenos relates how Olympos made his discovery. This third clue presented itself first. About the meaning of avalogía I am, philologically, still very sore; so will pass on, with the recommendation to look up the word in the

larger Liddell & Scott.

Slide. The various solutions proposed for the enharmonic tetrachord, from 350 B.C. to 1896 A.D. Those of Archytas, Serre, and Tartini (2) are correct solutions. By rejecting the just major third of Archytas, Torr put himself out of the running.

Listen, please, to this descending scale: major third, diatonic semitone, major tone, major third, diatonic semitone, major third, diatonic semitone, major tone, starting from 'F (actual pitch, about D above middle C). It is the vocal enharmonic in which Olympos composed his He left the division of the melodies, loved and lost. semitone to the instrumentalists. It has occurred to a number of musicians to add the harmonic seventh to the common accord; but Olympos apparently had the unique idea of adding the common accord, in arpeggio of course, to the harmonic seventh. The Olympion illustrates this, but with accords, not arpeggios. It was built to illustrate this . . . But it will not do so really well unless the temperature is just about 62° F. [It is now, most unfortunately, 72° F!]

We come at last to the only known specimen of Greek enharmonic music, a scrap of papyrus about 3 inches by  $3\frac{1}{2}$ , found in Egypt and made known in 1894 by K. Wessely. It is a fragment of a chorus, sung by men in unison, from the tragedy of Orestes, written and composed by Euripides, 405 B.C. Slide. This is Torr's restoration of the fragment, from the Introductory Volume of the Oxford History of

Music. The vocal notes are written over the text, a few instrumental notes in line with the text. Two of the instrumental signs occur nowhere else, but contrary to what has been stated and repeated, the vocal notes without exception and two instrumental notes are to be found in what Alypius called the Hypo-Lydian scales, in Macran's Aristoxenus, p. 56. This fragment has been much discussed, but to little purpose. Scholars are agreed that it cannot offer anything of value to modern music. They hold that its quarter-tones are insusceptible of harmony, and would sound utterly barbarous to modern ears.

I have time to discuss only one point. The first vocal sign in 1. 9, if it is what it looks like, a sprawling W, or M upside down, means B in the bass, and Euripides had done a most astonishing thing, though Torr says not a word about it. No rule could be more clearly stated than this by Aristoxenos (54), "Whatever be the genus, from whatever note one starts, if the melody moves in continuous progression either upwards or downwards, the fourth note in order from any note must form with it the concord of the Fourth." Here the four notes in continuous progression upwards from B to Bb cover an octave all but a chromatic semitone, and Euripides has broken the rule a century before it was formulated by Aristoxenos.

Slide. There is no other facsimile than that of Wessely. I have permission from the Austrian State Press to reprint it.

Slide. Here we have Torr and Wessely side by side. Where is the notch making three angles at the base of a W? Let us try the alignment.

Slide. A straight line drawn under the following three vocal notes, Sigma, Rho, Pi, shows that the apparent base of the first of the four is, in the original, 2mm. out of alignment. By producing the two sides of the disputed letter to a point on the straight line we get an inverse Alpha which may be compared with A in the text, as in materos, 1. 2. That is the required letter. The various guesses, Omega, Phi, Lambda Delta, Mu, are incorrect. Inverse Alpha in the relevant enharmonic scale (Macran, p. 56) means F. But F to Bb is not "the concord of a Fourth." It is the acute fourth, 20:27. Aristoxenos would find a difficulty here, perhaps. But for us it has been removed by the genius of Tartini. The two semitones which Euripides in this fragment (unlike Olympos) required his singers to divide, A—Bb, 25:27, 134c., and E—F, 15:16, 112c., are precisely the two which

Tartini divided on his violin by the harmonic sevenths of C and G. Tartini gives the ratios of his harmonised acute fourth, A-D, 20:27, so there is no possibility of a misunderstanding. He found the effect of his double-

stopping extremely pleasing.

This last slide is a transcription of the vocal notes in the fragment, the triangular notehead denoting a harmonic seventh. In the harmonisation which I shall now play, all the decipherable notes are employed as they come, with some remplissage to integrate the disjointed melos, in the key of

As a last example, God rest you Merry, Gentlemen, passing into the Dorian diatonic scale. As you hear, we must use 'F to descend from the second of the scale, and this proves that from E to D in the old diatonic from which Olympos took his departure was 10:9 (Ptolemy) as in our C major, not 9:8 (Didymus).

#### DISCUSSION.

THE CHAIRMAN invited Miss Schlesinger to open the discussion.

Miss Schlesinger: I wish you had asked someone else to speak first. I would like first of all to thank Dr. Perrett for his most interesting exposition of the whole subject. He has touched upon so many points of deep interest to me in Greek music, that I find it difficult to single out any one for special reference and to say anything lucid in a very short time on this subject. But I think that we understand the title quite differently. I do not know whether I am right in assuming that the "Heritage of Greece in Music" should be taken as suggestive of what can be made out of the scale of Olympos for future use, or whether it signifies what it means to me, viz., all that Greece has left us: the foundations of our theory of music and of the science of acoustics, which have been further developed through the Middle Ages, and more especially the Keys and the Modes still surviving now in folk-music.

But one point I would like to make which I consider of vital importance. In all these discussions with regard to ancient music, more especially Greek, before any theory of this kind can be accepted, it seems to me that it must be demonstrated that the two instruments which were in use in Greece, viz., the Kithara and the Aulos, were capable of reproducing the scale specified in the theories; that it should be possible, for instance, on an Aulos to play Dr. Perrett's

interpretation of the scale of Olympos, the Phrygian Piper.

According to my experience and to available evidence, that is absolutely impossible on any primitive reed-blown instrument. The Aulos was a reep-pipe played either with a primitive oboe mouthpiece or a primitive clarinet mouthpiece, and the part of the pipe in which the finger-holes are bored is only a resonator. All resonators respond only in obedience to the law of proportion and in accordance with what has been initiated through the mouthpiece. To suggest that a sequence such as this highly sophisticated scale of Olympos could be put on an Aulos by a primitive pipe-maker would be a very difficult proposition to substantiate.

The original resonator is converted into several, of different lengths, by the opening of the finger-holes, and the mouth-piece must be capable of adapting its vibrations to each of these proportional lengths. This is accomplished instinctively by means of a series of proportional processes in which piper and mouthpiece both take part. The suggested methed of bringing the scale into being by cyclic fifths and sevenths cannot be carried out on an *Aulos*. Even if the resulting scale be referred to the *Kithara*, there would be cogent reasons against the hypothesis, the least of which would be the cardinal error of its attribution to the great Phrygian piper.

So that when I have said this, I have not answered any special point. I have only indicated the difficulties, and I think I will leave it to others to bring forward points which will probably be of greater interest to members of the Musical Association, being of a more musical and less evolutionary nature.

Mr. Weston: Did I understand Dr. Perrett to say that the *Orestes* fragment was the *only* fragment? He did not mean that, did he?

Dr. Perrett: It is absolutely the only specimen there is of the lost enharmonic genus which Aristoxenus valued very much above the other two genera.

Mr. Weston: In Archytas you referred to a Dorian method of pitch definition. How far do you go in that very interesting question? Did you not refer to the Dorian method of definite pitch?

Dr. Perrett: The word tonos was already a source of confusion to the Greek writers themselves. Even in Greek it had three distinct meanings. Tonos can mean "mode" and it can also mean "pitch." The pitch of this Fragment, according to Emmanuel, would be Hypolydian, because the

Greek chorus, consisting of men, were not asked to sing above the note F, that is our D above middle C, so that the notes to be sung were always well within the compass of the baritones and basses as well as any tenors who happened to be there. Hence this Fragment would be in the Hypolydian pitch.

If you turn to Macran's Aristoxenus, page 56, you will find, contrary to what has been said by many people, that all the vocal notes without exception are there, and the two decipherable instrumental notes are also there. Macran gives the approximate values to these notes, and by defining the relative pitch as accurately as possible my instrument gives the true values, or would have done, but that the temperature has gone up to 72 degrees, whereas this instrument is tuned for 62 degrees Fahrenheit. Does that answer your question?

Mr. Weston: Yes, practically. I was aware of that fact, but I wondered at your making a statement which seemed to imply that there was a distinct conception of pitch as we view it in these days.

Dr. Perrett: No, it is simply by working out the intervals given by the ratios of the Pythagoreans, chief of whom was Archytas. The absolute pitch of the Greek "middle note," our A, is supposed to have been about a minor third below the A of this instrument, which is that of the French "diapason normal," 435.4 v.d. at temperature 15° C=59° F.

Mr. Ernest Fowles: Do you differentiate one mode from another on an interval basis?

Dr. Perrett: I do not say that the diesis of Archytas comes in only in the one place. On this instrument it comes in only in one place. It should be possible to divide a major tone harmoniously into three parts, because two chromatic semitones and the diesis of Archytas together make up a major tone to within half a cent—a difference that is quite imperceptible.

Mr. Fowles: Was that fragment part of a Bacchic ode? Dr. Perrett: It comes from a chorus lamenting the sad fate of Orestes. It is in the enharmonic genus of the Dorian mode.

Mr. Fox-Strangways: I think this is a marvellous lecture and I have enjoyed it enormously, as much as I could understand. My trouble in understanding it is that Dr. Perrett, with the very best intentions, has never told us what the thing which he sounds on his instrument is representing. I do not really know what he is trying to tell us.

My impression of Greek music generally is this. First of

all, nothing whatever is known about the rhythm. Secondly, very little indeed is known about the tune. With those two things, I do not think you can call this lecture a lecture on Greek music. You can call it a lecture on Acoustics.

The second point is that I do not think this is a lecture

on Greek acoustics, but simply on Acoustics.

We were not told really what precise meaning 7:5 or 10:7 had, or what the exact point is that they had in the scales. To understand that we should need to have the scale with notes, really to see where they come in.

Then Dr. Perrett in his enthusiasm, after playing the tune that was put on the screen in front of us, proceeded to harmonise. He harmonised for about what one would call three bars. Then one lost oneself, and then he went on for another twenty bars after the tune ought to have finished. I do not know how we can understand that.

I heard Dr. Perrett lecture on a former occasion (before some philosophical society, I think) and I heard his instrument then. The harmonium is a very great improvement on it, because one can at least hear the consecution of the chords. My hearing is not good enough to tell me what the chords would sound like as against what he is actually playing, because I have first to think which is the key-note, then what chord he is sounding, then what it would sound like in equal temperament, and then to compare that with what it does sound like. I am afraid it is too much for me.

So if some day he could make it a little clearer, I feel it would be a very interesting lecture indeed.

But may I say that I really did enjoy listening, hoping I could understand? I cannot say any more, though I have the best will in the world.

Mr. LLOYD POWELL: Did I understand from your lecture that Greeks did harmonise their melodies or that they did not?

Dr. Perrett: There is no evidence at all of more than two notes sounding together at any time.

Mr. LLOYD POWELL: Then your examples have nothing to do with Greek music. They would never have harmonised it?

Dr. Perrett: I think they did in their best period before they tempered their scale and lost harmonies altogether. Their tempered thirds were dreadful.

Mr. LLOYD POWELL: Then you mean that in their best period they would have sounded more than two notes simultaneously?

Dr. Perrett: I think only in arpeggios.

Mr. Hunt: I would like to ask one question. You played us the German sixth just now so that it sounded as a concord, and I believe it is possible to play on that instrument a dominant seventh sounding as a concord. Is it possible to make discords, which have been known as the dominant ninth, eleventh and thirteenth, sound as concords?

Dr. Perrett: I have not sounded a dominant seventh at all. Ellis went on another very important step, from seven, that is fourteen, to seventeen, and that makes a new triad, or division of a perfect fifth, 14 to 17 to 21. I have heard it because I have tuned one or two reeds temporarily to this ratio, and then I have had to tune them back. If this Ab is flattened by seven cents it becomes the 17th harmonic of G. The 17th harmonic here would spoil the note I have already got and want. A great many desirable notes are missing on this instrument.

Mr. HILEY: Perhaps Dr. Perrett will tell us what he did when he multiplied the three or four bars into about twenty? I did not quite follow that process.

Dr. Perrett: I just put in what is called remplissage. That is all. There are numerous gaps in the fragment. If your melody breaks off, leaving gaps, you must fill them up somehow to make the thing continuous. I did perhaps exceed my time allowance, but I cannot plead guilty to anything else.

CHAIRMAN: I am afraid the lantern has gone away. Otherwise I think we might have asked you to go over that quotation in your own notation again.

Mr. Broadwood: There were, were there not, certain modes which were considered definitely bad to use in ancient Greek music? It seems extraordinary that certain modes were considered vulgar and others not. For instance, certain modes only were used for the Bacchanalian music.

Dr. Perrett: The late Théodore Reinach studied Greek music for forty years, and at the end said he had not an idea what the modes meant. They constantly shifted, and what was supposed to be very fine at one time was supposed to be very bad at another. This enharmonic genus, which Aristoxenus writes about as something wonderful, came to be an object of extraordinary dislike in the time of Aristoxenus himself.

Mr. Broadwood: Were certain modes not allowed to be sung except by women?

Dr. Perrett: I cannot say. The literature is so voluminous, I cannot claim to have read one-twentieth of it. I do not think I ever shall.

Mr. Fox-Strangways: Could you sound a 5/7 and then an ordinary inversion of it?

Dr. Perrett did so, and added: I have tuned the instrument very accurately for 62°, and I know that a change of 5° either way makes the thing go sour like cream in thunder weather. I believe that the difference of 2° F. is noticeable. It is not a matter of fine musical ear at all. It is quite mechanical.

You will find the figures in the late Lord Rayleigh's Theory of Sound, which may be acoustics, but is also an extremely fine book. It has been shown by an immense amount of experiment that no ear can distinguish melodically two notes in succession which do not differ by more than point three of a vibration in the most sensitive part of the scale, but when two notes are sounded together, as Lord Rayleigh shows, there is no limit to the fineness of discrimination by the method of beats. I believe that is the only instance in which any human sense is capable of an unlimited fineness of discrimination; but it does not mean that you must have a very keen musical ear in order to do it. It is simply that you get alternations of sound and silence. Anybody can note them.

Miss Schlesinger: If one gets the original notes that correspond with the notation of the *Tonos* in which the fragment is noted, one gets a somewhat different version of the *Orestes*.

Dr. Perrett: I follow Reinach in taking it to be the Dorian mode. Emmanuel's treatise is the most illuminating of all I have read. I have got more help from Emmanuel than from anybody else—except, of course, Wallis.

Miss Schlesinger: I believe that Maurice Emmanuel bases upon Bellermann's interpretation of notation? It will be proved before long that Bellermann's interpretation of Greek notation makes arrant nonsense of the whole thing. The one point which he held to be infallible, i.e., the same tetrachordal unit throughout every *Tonos* has been proved a fallacy, if one follows Bellermann's own evaluation of the symbols of notation given by Alypius.

The CHAIRMAN then adjourned the meeting after thanking

Dr. Perrett.



The Continuing Modernity of the Ancient Greeks  $\,$ 

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# The Continuing Modernity of the

### Ancient Greeks

(As Considered at Copenhagen)

N Copenhagen was held August 23-28, the second congress of the International Federation of Classical Studies, devoted to the formation of the mind and of methods of thought. The central theme was the classical pattern of modern civilization. This was one of the most scholarly and yet harmonious and cheerful of such con-

gresses ever attempted, with perfect organization, rare efficiency, highly helpful hosts. Nearly five hundred scholars of international fame from all countries of Western Europe and the Near East, and even from S. Africa and Canada, Australia and New Zealand attended.

From the United States

and Phobos hurtles through the skies, dangling over the terror-stricken human race the modern sword of Damocles, the H-bomb. The great Pan, Vergil's Pan, deus Arcadiae, is dead.

Now I would give (such is my need) All the world's store of rhythm and rhyme

To see Pan fluting on his reed And with his goat-hoof keeping time.18

But it's no use wishing, Sir Poet; for the vision has faded into the limbo of past things.

Audax omnia perpeti, gens humana ruit per vetitum nefas; and correspondingly today's poetry must be taut and tough and angry-eyed. Corydon among the tamarisks of Mt. Maenalus has given place to ape-neck Sweeney in a tavern of the Wasteland. When Tennyson, a mere century ago, strolled through a forest in merry England with Arthur Hugh Clough,

Round them all the thicket rang To many a flute of Arcady.

But Edwin Arlington Robinson already lived in a harsher time, when iron blows had hushed the flutes.

In dreams I crossed a barren land, A land of ruin, far away; Around me hung on every hand A deathful stillness of decay; And silent, as in bleak dismay That song should thus forsaken be, On that forgotten ground there lay The broken flutes of Arcady.19

CLARENCE A. FORBES Ohio State University

#### Notes

1 Werner Weisbach, "Et in Arcadia ego: ein Beitrag zur Interpretation antiker Vorstellungen in der Kunst des 17. Jahrhunderts," Die Antike 6 (1930) 127-145.

2 Ellis K. Waterhouse, Reynolds (London 1941),

plate 127.

3 Wm. Shenstone, *Letters*, ed. by Duncan Mal-

3 Wm. Shenstone, Letters, ed. by Duncan Malam (Minneapolis 1939) 375.

4 A. Gercke, "Auch ich war in Arkadien Geboren," Neue Jbb. für das kl. Alt. 24 (1921) 313-317, observes that it is better to leave the motto without a verb, as in the Latin; but in any case no others have joined Schiller in suplying the verb "was born." Gercke refers to half a dozen other standard German authors who have used the motto.

other standard German authors who have used the motto.

<sup>5</sup> W. D. Howells, Modern Italian Poets (New York 1887) 10.

<sup>6</sup> Philost. Vit. Apoll. Tyan. 8.7.43.

<sup>7</sup> Polyb. 4. 20-21.

<sup>8</sup> E. Kapp, cited with approval by E. Panofsky in his essay "Et in Arcadia ego," in Philosophy and history, essays presented to Ernst Cassirer (Oxford 1936) 225, and by Bruno Snell in "Arcadia: the discovery of a spiritual landscape," in The discovery of the mind (Oxford 1953) 281, has argued for Polybius as Vergil's source. But Gilbert Highet, The classical tradition (Oxford 1949) 611 f., has pointed out the flaws in Kapp's view, and likewise Karl Büchner has upheld Pan rather than Polybius: Lateinische Literatur und Sprache in der Forschung seit 1937 (Bern 1951) 115 n. 1.

<sup>9</sup> Anth. Pal. 6.96, by Erycius, begins thus: Glaukôn kai Korudôn, hoi en ouresi boukoleontes,

leontes, Arkades amphoteroi.

Arkades amphoteroi.
The poet's name was really Erucius, and he was a Roman citizen, writing within a decade or two after the Eclogues were published: C. Cichorius, Römische Studien (Leipzig 1922) 304-306.

10 Ph. E. Legrand, "L'Arcadie et l'idylle," REA 2 (1900) 101-116; see 108 f.

11 Trans. by Theodore C. Williams.

12 E. R. Curtius, Europ. Lit. und lat. Mittelalter (Bern 1948) 195.

13 Traces of Arcadia appear in Nemesianus' third Eclogue.

14 Curtius on. cit. 189.

third Eclogue.

14 Curtius op. cit. 189.
15 Don Quijote 2.67 (Motteux).
16 Vastly entertaining is Howells' account of the "Arcadian shepherds," Modern Italian Poets (New York 1887) 11-24.
17 H. Hauvette, Littérature italienne<sup>6</sup> (Paris 1924) 322. For this reference and much besides I am indebted to Highet, op. cit., chapter 9 and notes.

18 Maurice Thompson, On a fly-leaf of Theocritus.

19 E. A. Robinson, Ballade of Broken Flutes (with acknowledgments to The Macmillan Company).

Charles Babcock, Doris Barnes, E. Bassett, Blegen, Miss Braginton, F. Brown, Robert and Wallace Caldwell, Cherniss, William von Fritz, Gelb, J. Hanson, Harsh, Miss Marti, Gertrude Smith, Lily Taylor, Homer Thompson. Cantrill of Princeton sent a printed paper on "Moral Ideas Toward A Humanistic Psychology," and Arnold Rose of Minnesota, "Some Reflections on the Influence of Ancient Thought on Ideas." Contemporary Moral classicist can aid his fellow social scientist by delineating the basic cultural values and tracing their acceptance or modification to the present day. He can add knowledge about the nature of human behavior in cultures different from our own and so make a fundamental contribution to the study of comparative culture.

I listened to some forty original papers in many different departments (many of them already in proof) with time for elaborate discussions and criticisms. There never was a congress with so much time allowed for discussion and to the speakers. Professor Childe spoke one and a half hours. No congress has ever been so well entertained physically and intellectually. I attended three receptions and several private dinners. No better place for a reception than the sculpture gallery of the Ny Carlsberg Glyptotek (supported by the Carlsberg Brewery), no more distinguished reception than that by the Danish Minister of Education in the Salle des fêtes in the University where was celebrated the 150th anniversary of the birth of the Danish superb scholar Madvig, who combined meticulous mastery of grammar with a broad view of the classics and who was a prominent politician. This was well illustrated in the printed pamphlet by H. J. Rose's translation of Van Proosdy's "Two Thunder-Clouds, Closing in Conflict, the Meeting of Madvig and Cobet at the Tercentenary of Leyden University and Its Historical Background." (47pp. Leiden, 1954). The subjects of the congress were the formation of moral ideas, forms of thought, language, science, music, town-planning in which Olynthus played a prominent part, portraiture, metrics, papyri, inscriptions (the only subject poorly represented).

The main papers of general interest were read in the aula which has the shape of the Olynthian assembly hall, imitated in the new House of Commons, with seats on either side of the center and at right angles to the speaker's platform at the end (also like the ancient Phokikon). Jean Thomas and Ronald Syme emphasized the similarity of the ideas and ideals of this congress with those of UNESCO and FIEC. Marrou spoke on Formation de l'Esprit, stressing the classical structure of modern occidental civilization which can learn much from the great examples of thought from Thales to Socrates, from Justin Martyr to Chrysostomus. Webster gave a brilliant lecture, even with use of Greek Vases in Mississippi, "From Primitive to Modern thought in Ancient Greece," showing that the Greeks had a minimum of specialization. The decipherment of the Minoan tablets helps demonstrate what I have held for fifty years, that Homer is early and paratactic, not hypotactic. Things are human beginnings in these tablets as in Homer. The Cornland and the Goddess are identical. The sis nouns, perhaps participles in origin, were concrete. Apodosis means in the thirteenth Century B.C. "repayment." Physis meant growing and nature was a goddess who willed it, who had no care for laws. The Greeks were close to nature and Sophocles wrote about nature. This so-called primitive view of the world is continually reasserting itself, because the Greeks seized on personal and pictorial methods of expression, and secondly because the Greeks appealed to facts, the conscious philosophical approximation of mathematical argument and the development of technical terminology. Thirdly, this leap out of the primitive into the modern world was possible because Greek poets, artists, politicians, doctors, biologists, mathematicians and philosophers were in daily contact with each other and could cross-fertilize each other. The recreation of conditions for such fruitful contact is perhaps our most difficult problem today.

Bruno Snell showed the importance of Greek forms of thinking. The Greeks first conceived forms of thinking as man's own independent activity, orderly and in an orderly kosmos. But the Greeks never allowed thinking to become rigorous or inhuman. The Greeks taught us to be human.

There were three afternoon sessions on Monday, one with Groningen presiding, devoted to discussion of the three papers, another with presiding, Romanelli on new chaeological investigations. Bradford showed slides of aerial research, giving a new complete Olynthian plan of Rhodes. Matz talked on sarcophagi, Gentili on Syracuse, Dyggve on Thessaloniki. In section III Hjelmslev and Leumann for three hours led a discussion on problems of phonology.

Tuesday morning in the Polytechnic School was an important session on the "Classical Pattern of Urbanism and Town-planning." Lauffray spoke on the Near East, Kriesis (70 pp in print with many plans of Olynthus) on Greece, Boethius on Italy, Perkins on "Early Roman Town-Planning." The subject of housing has been neglected (the Olynthian type still survives). The house is one of the predominant expressions of human sociability and throws tremendous light, as I myself have tried to show at Olynthus, on state religion, economics, townscape, the arts, landscape and technics. In Greece from Minoan days on, Hellenic towns were laid out with a pattern of decentralization, as a result of the social organization of genos, phratria, phyle, etc. It was the community which created the townscape. The modern idea that the townscape will create the community, in the future may be proved wrong in

some places. Kriesis thought that a street never ran through an agora and perhaps the exception of the Panathenaic road in Athens goes back to a time when it bordered the agora as in the two agoras at Olynthus. Boethius brilliantly demonstrated that the nova urbs of Tacitus (Ann. 15.43), the brick-covered concrete Roman architecture of the second century, created a new starting point for urban development. Older elements had importance only as reshaped. Other architectural types dwindled away and the pagan empire became (like the modern world) a society with no prestige values. The traditions of pagan classicistic architecture were destroyed and ecclesiastical buildings replaced temples. Basilicas, lavacra, cemeteries, town structures took over with emphasis on peristyles and porticoes. Tenement houses transmitted to the Middle Ages the experiences of town life. The house type consisting of a row of tabernae, independent rooms, each with a wide door towards a court or street, became frequent. In spite of Martial's criticism they are still part of the charm of every old Italian town. Nothing illustrates the abodes of the plebs of old Rome or Ostia better than the endless rows of the one- or two-storied shops which I saw this summer along the roads of Southern Italy and Sicily. Augustus, Nero, Trajan, even Zeno in the century protested against high-towering houses. Roman tenement houses were the model for mediaeval times. Italy has twice written a new chapter in the history of town-building, the tenement houses of Imperial Rome, and in the closing centuries of the Mediaeval Ages, the typical Italian town house with its rows of shops along the streets. There is a historical connection between them which has been neglected in studying the legacy from that typically Roman, non-Greek creation, due to civium infinita frequentia. Were Florence, Milan etc. influenced, whereas England, France,

and Africa were not? Roma docebat in spite of decay. But the new town architecture was formed in Tuscany and Northern Italy, and the town builders must have had access to Roman remains and traditions. Ancient traditions lived on in spite of the downfall of the Empire and led to new endeavors in spite of changed and changing conditions.

Perkins demolished the accuracy of Pigonini and the idea of a planned Roma Quadrata. Rome, like Topsy, just grew. There was no urbs before 575 B.C. The Septimontium festival was celebrated separately in the Hill Towns (except the Quirinal). Italic towns were walled, with a road just inside the walls, and not influenced by Greece. Even Marzabotto. But, though Olynthus perhaps had no roads just inside the walls on the west side of the north hill, I believe that it may have had a road inside the north and east sides; and certainly on the south hill there was a road along the east and west sides (though possibly with houses against the walls in some sections). There was no road on the south hill from north to south through the middle. Furthermore, the regular blocks of houses and streets resemble Olbia and Olynthus and the Hippodamian plan too much for me to accept Perkins' idea of Italian originality. Towns with porticoes and shops in the lower stories and with upper stories and stairways from the front or from the court are survivals of ancient Roman towns. Italy was a late comer in the field of urban civilization. The unit of Italian communal life was the village or farm and the economic basis was agricultural. Passo di Corvo and Milazzese are good early examples. Etruscan cities likewise were products of spontaneous growth. Marzabotto is an exception, founded c. 500 B.C. It was a military settlement and may have shown Etruscan influence, but I still believe that those who laid out the town knew Greek cities of the Hippodamian grid-plan, whereas Alba Fucens and Cosa (founded c 303 and 273 B.C.) are typical of the Roman military colonies of the fourth and third centuries B.C. Perkins thinks that Etruria rather than Greece played the dominant role. Many towns, I believe, like Rome just grew. But others, especially the colonial and military ports were deliberately planned, and some under Greek influence. Cities, like Ocriculum, found themselves under Roman rule and acquired prosperity by moving down from the hill to the Via Flaminia or other roads. When Roman power declined, Ocriculum went back up the hill to its present position. So with many hill towns which as Palestrina, after the bombing of 1943, crept down towards roads and railways. Should Dark Ages return, modern towns may return to the hills and leave the villages in the plains to be excavated by future archaeolo-

In the afternoon three hours were given to detailed discussion of townplanning in one section; while in another excellent papers were read by Kakridis on "Classical Tragedy in the Light of New Texts" and by Zuntz on "Contemporary History in Euripides." In Section III (35 present) Gertrude Smith showed with the help of a recently discovered inscription what in Cretan Law was different from Common Greek law. Crete was more aristocratic, no popular courts as at Athens. A Boule of es-kosmoi, no homicide cases, exposure of children (however. more regulated), more slavery and more authority in hands of kosmoi. Amundsen (known for his fine forgery at Karanis of a letter of Sappho to me on a genuine piece of papyrus) gave a brilliant paper on the "Classical Greek Background of Ptolemaic Law," with use of the new manuscripts of Theophrastus, who now becomes the first scientific student of law.

On Wednesday, Chantraine spoke on morphological problems (30 pp of proof in our hands), Devoto on "The Classical Structure of Modern Civilization." He surveyed Latin linguistics in the modern

world. Our prose in its syntax and vocabulary has fully drawn from Greek traditions and from Plato and Aristotle, Franz Blatt spoke on L'influence latine sur la syntaxe des langues européennes." The paper (37 pp were printed in English) concluded that the architecture of the sentences or phrases and the rationalization of language suffice to prove that modern European syntax bears the stamp of the Latin genius. European standard languages of today are useful instruments tuned from Classical Syntax. But the largest audience (400) heard Amandry on Delphi, Müfid Mansel on Sidé and Pergé (with its two wellpreserved round towers, many bases of ktistae, statues of Asclepius, Hermes, Dioscuri, and Aphrodite resembling the Venus di Milo); Homer Thompson on the Agora, and Ashmole on Cyriac of Ancona with an account of the manuscripts in the Wartburg Institute in London and the Barbareni manuscripts in the Vatican. He presented important new material on the smaller temple at Baalbek and on the temple of Hadrian at Cyzicus (adding much to T. Reinach's article in BCH 14, 1890, 516-545), showing how Cyriac should have credit for a good corpus of inscriptions and statues but that Latin scholars have often misunderstood and changed his original drawings, even putting floral designs on Doric capitals in his original drawings. He proved that Aristenetus erected with the wealth of all Asia temples at Cyzicus and Baalbek. The afternoon was wisely devoted to scholarly tours through the Glyptotek, National and Thorvaldsen Museums.

On Thursday an important joint session listened to Düring's authoritative lecture on "The Impact of Greek Music on Western Civilization." The Pythagorean complete theory of music, based on number, but emphasizing also the human ear as Aristoxenus advised, has persisted through Byzantine to modern times. It is one of the basic elements of modern society. Hoeg, successor of Madvig, organizer of the

Congress, also spoke as an expert on music; and modern Danish music was represented by the Cantata on Seneca (by Koppel). Dijksterhuis discussed the meaning of Greek science and mathematics in the modern world. Momigliano spoke on "Causes of War in Ancient Historiography." Herodotus is a better source than vague Thucydides, and Polybius is not good on origins of war. He thought that war was a necessity. Livy, Tacitus, St. Augustine are more concerned with causes of revolution.

In section I in the afternoon, Gjerstad discussed the light new excavations throw on the earliest history of Rome. Romanelli substituted for Maiuri and showed slides of recent excavations in the Roman Forum near the Temple of Vesta, on the Palatine, and at Palestrina. Santa-Olalla of Madrid, talked on Italica. In Section II, Latte read a good paper on "Methoden-probleme der modernen Religionsgeschichte;" Quispel on "The Gnostic Writings of Valentinus recently discovered in Hanhammadi." In Section III, Genzmer read on "Das Romische Recht als europäischer Kulturfaktor," and Arangio—Ruiz on "Rome, La double Citoyenneté et la vigeur du droit romain en Egypte;" and Visscher, "La droit de cité," with an hour's discussion of the three papers.

On Friday morning, Van Groningen spoke on "Le Grec et ses idées morales," and Festugière on "Les trois vies," with two hours' discussion of "La structure classique des Idées Morales." Section II on Archaeology drew an audience of nearly 400 with papers by Childe, "Relations between Greece and Prehistoric Europe;" Blegen on "Nestor's Pylos," showing the palace with megaron, propylon, well preserved stairway to second story, side rooms and many paintings and tablets, a palace more interesting than the similar one at Tiryns. Marinatos reported on his important new excavations near Pylos and on "Mykenetum und Griechentum" (discussion  $1\frac{1}{4}$  hours). In the afternoon Ventris, the brilliant, tall, handsome, English architect who deciphered the Minoan tablets, with an honorary Ph.D. of Uppsala, discussed for three hours with Gelb, Blegen and leading philologists the supreme importance of his discovery. With the material remains it gives for the first time a real knowledge of the earliest Greek civilization, dating about 1000 years earlier than scholars (except Wace, Blegen, Mylonas, and myself) had supposed. Fifty years ago I said repeatedly that Mycenaean civilization would prove to be Greek. Now it is an established fact, and we can study it in connection with the contemporary civilizations of the East.

Saturday was devoted to a joint section presided over by Frank Brown, with papers by L'Orange, "The Antique Origin of Mediaeval Portraiture"; "Schweitzer, "Die Bedeutung and die Geburt des Porträts bei den Griechen"; Vessberg, "Roman Portrait Art"; "Sass on "The Classical Tradition in Later European Portraiture." (Two hours' Discussion in the morning and another two hours in the afternoon.)

There is not space to tell of the many other small scholarly meetings, conferences, plans for research and for publications, of exhibitions by the Berlin Academy on the Church Fathers, and of a *Manuel Homérique*, exhibitions of manuscripts and illustrations of Classical authors before 1800, of Classical studies in the Scandinavian countries, and of the social excursions. Let me summarise my general reaction to this great Classical congress.

Now we can understand the Greek leap. It is the west European tradition which we have inherited from Greece, not a development of 2600 years but of 3600 years or more. As one reporter of the congress said, "This we acknowledge in our art and architecture, in our moral and social standards and in our political activities. This has been said often enough before but it can be

said again more accurately and precisely, and to say it again is not so much propaganda for Classical studies as an affirmation of faith in the living tradition of western civilization." Everyone was amazed at the vital interest in Classical studies which are thriving (better than in America) in most countries of Europe and the Near East. (I speak from visiting some twenty different countries and conducting myself, as did the English, the Bureau of University Travel, the French and even Queen Frederica of Greece with ninety royal and other guests, a cruise of 220 to the Greek islands and mainland.) In art and literature and thought (two modern physicists, one Finnish, one German displayed their recent detailed books on the earliest Greek philosophers) the Greeks more than once leapt out of their contemporary civilization into a modern view of the world. We today are leaping out of our context in technology. But we must follow the Greeks and make advances in moral, social, political and international thought. If we study the Greeks and the papers presented at this great congress, we can learn how to make such a leap forward. Perhaps we Classicists can teach the modern psychologists how to find out about the brain itself and how it works. We should be able to provide data for sociologists and even anatomists to use in a more precise and scholarly coöperation of many different disciplines. This congress, when its papers are published, should provide important practical material for the next leap of civilization. The Greeks first taught us to think (see my pamphlet on The Greek Way of Life (Social Studies in Mississippi, 4, 1953). If we can get the modern world to think precisely and accurately we shall have learned the great lesson that the Greeks are ever modern. There will be a better savor in modern food, it is seasoned with Attic salt.

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Greek Music and Its Relation to Modern Times Author(s): J. F. Mountford

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#### GREEK MUSIC AND ITS RELATION TO MODERN TIMES.

(Being the Cromer Greek Prize Essay for 1919.)

I.

In Greece the art of music was honoured as scarcely inferior to poetry itself, and in lyric and tragic compositions at least the two arts were almost inseparably allied. The religious and athletic assemblies, the Panathenaia, the Olympia, the Pythia, the Karneia, etc., were not complete without a goodly number of musical celebrations, and from quite early times an important musical contest had been held at Delphi in which the greatest singers and instrumentalists took part. At Athens the free-born youth was trained in the essentials of the art, and music was considered so much a part of the national life that innovators were not infrequently charged with aiming at the subversion of the state itself. Greek literature is so full of allusions to, and metaphors drawn from music, that a question of real interest and importance often presents itself to us: how far are we in Europe, who have inherited so much in literature and the plastic arts from the Greeks, also indebted to them for our modern music? Is there, in short, any recognisable chain of descent from Terpander and Timotheos to Beethoven and Wagner?

Strong negatives and affirmatives have been given to this question because of the doubt which exists about the real nature of Greek music itself. Some enquirers believe that ancient Greek music contained the germs of that ecclesiastical system from which modern music has been evolved; others arriving at different conclusions, deny that the music of the golden age of Greece bears any real relation to that of modern times. This one point at least is certain: unless we can show that mediaeval music is only a later stage of Greek music, any search for a connexion with modern music is doomed to failure. The object, then, of this paper is to discuss the nature of Greek music itself, and to trace its history as far as mediaeval times.

It is common knowledge that the basis of the ecclesiastical music of the middle ages was a number of scales, known technically as 'modes,' which differed from each other in three ways:—

(1) Though they each consisted of five whole tones (T) and two semitones (S), the arrangement of these tones and semitones differed in the various scales.

- (2) The chief note, or melodic centre, known as the Dominant, occupied different relative positions in different modes.
- (3) The note on which a melody written in one of these modes generally ended was known as the Final, and did not necessarily have the same relative position in all the modes.

For example, in the two following scales:—

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D E F G A B C D (the first Gregorian Mode),
B C D E F G A B (the fourth ,, ,, ),
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there are the following differences:-

- (1) The scheme of tones and semitones in the first is: T S T T T S T; in the second it is: S T T S T T T.
- (2) The Dominant of the first is A, the fifth note of the scale. The Dominant of the second is also A, but it is the *seventh* note.
- (3) The Final (i.e. the melodic ending note) of the first is D, the first note of the scale. The Final of the second is E, the fourth note of the scale.

Now if the rudiments of a modality something like this cannot be satisfactorily traced in ancient Greek music, we must admit that the chief factor in the evolution of the mediaeval modes was not Greek. If, on the other hand, some such modality (even though of a very elementary nature) can be traced in Greek music, we shall be justified in searching for the connexion between this modality and the mediaeval music. Thus the first thing we have to settle is the question whether Greek music was essentially modal or not. But before examining any evidence ourselves, a short summary of the more important opinions expressed on the subject may be useful.

(1) There is a strong feeling among musicians that it would be entirely anomalous if the art as practised by the Greeks had had no influence and left no traces on the art of the present day. The Oxford History of Music, while not committing itself on the subject of early Greek music, admirably expresses the point of view (Preface to Vol. I. p. 6); 'Music, among all the arts, has exhibited the most continuous evolution. six centuries of work went to provide Purcell with his medium. Even those changes which appear most violent in character may all be rightly regarded as parts of one comprehensive scheme; sometimes adjusting a balance that had fallen askew, sometimes recalling a form of expression that had been temporarily forgotten or neglected, never wholly breaking the design or striving at the impossible task of pure innovation.' Such a view if unsupported would be mere prejudice; but for centuries it had been noticed that the ecclesiastical modes bore the names of Greek races just as did the Greek scales which Plato and Aristotle call άρμονίαι. This coincidence of nomenclature scarcely seemed attributable to mere chance. Furthermore, there was a persistent tradition that St. Ambrose of Milan took four scales from the Greeks to be the basis of liturgical music, to which St. Gregory added four more. These two things seemed to indicate so intimate a connexion between Greek and mediaeval music that scholars approached the study, consciously or unconsciously, with that presupposition. Boeckh, Bellermann, Marquard, Westphal, Fétis, and Gevaert, all believed that evidence from Greek sources gave sure ground for assuming as proved the connexion between the old Greek scales (ἀρμονίαι) and mediaeval music.

- (2) In 1894 D. B. Monro published his book The Modes of Ancient Greek Music. There he examined the evidence afresh and concluded that the ἀρμονίαι differed chiefly in pitch: that is to say, the Dorian scale differed from the Phrygian not as C major differs from C minor, but as C major differs from Eb major, for example. 'If difference of mode or species cannot be entirely denied of the classical period of Greek music, it occupied a subordinate and almost unrecognised place' (p. 108). According to Monro the liturgical scales came not from Greece proper, but arose in Alexandrian times and are first found in the work of Claudius Ptolemaeus, a savant of the second century A.D. Such a theory was fatal to all ideas of relation between music in the days of Pericles and our own. Monro's book was adversely reviewed by H. S. Jones and Von Jan, but the reputation of the author and his skill in arranging his evidence and making inferences persuaded many of the soundness of his views. The new edition of Grove's Dictionary of Music is inclined to accept the theory, and the Encyclopaedia Britannica says boldly; 'All the evidence irresistibly tends to the conclusion that the Greek "modes" were a series of scales identical in arrangement of intervals and differing only in pitch."
- (3) The late Professor Macran in his edition of Aristoxenos (1900) brought forward another theory. In dealing with the ἀρμονίαι he believed there were only three kinds, a Dorian, an Ionian, and an Aeolian which survived the others (p. 18); but the most important and ingenious part of his work concerns an incipient modality which he finds in the seven 'species of octave,' εἴδη τοῦ διὰ πασῶν. In the scale:—

#### A B C D E F G A B C D E F G A

the seven successive octaves, B-B, C-C, D-D, etc., have different successions of tones and semitones; they are different 'species' or 'kinds' or 'schemes' of octave. Prof. Macran asserted that there were in use seven such octave scales, all of the same pitch as a whole, all commencing on the same note; but that the chief note in each, *i.e.* the note most frequently used in melody, was in a different relative position. In one scale it would be near the top, in another at the bottom. He thus combined the pure modal view with the pure pitch view; for undoubtedly the sequence of intervals differs, yet at the same time a scale whose chief note is high up will give higher-pitched melodies than one whose predominant note is lower down.

(4) The late Professor Cook Wilson in a paper read before the Oxford Philological Society in 1904 proposed a theory which reasserts the pure modal view of the ἀρμονίαι, but differs considerably in details from the Westphal-Gevaert one.<sup>1</sup>

A full account of this theory is given in Mr. Denniston's valuable article: 'Some Quarterly, April, 1913.

(5) Mr. Cecil Torr's Interpretation of Greek Music (1910) indirectly attacks the idea of a connexion between Greek and modern music from a standpoint entirely opposite to that of Monro. His thesis is that the Greek scales known as τόνοι (which are quite distinct from the 'octave-species' and are generally believed to have differed solely in pitch) actually made use of intervals differing minutely but quite perceptibly from one another. tones and semitones of the τόνοι followed one another in the same order in all the τόνοι but one tone differed from another in size, one being normal, another being a shade small. This would mean that the Greeks used intervals unknown in practice to Western civilization. Mr. Torr himself says, 'The charm of the ancient melodies was the subtle variation of the intervals through which they rose and fell; and all their charm is sacrificed when they are forced into a modern scale.' 'Greek music with the tempered scale would be as bad as Greek architecture with straight lines substituted for its subtle curves.' If that is so, it would be difficult to trace any connexion between these delicate semi-oriental scales and the modern one.

In view of this variety of opinions it is not surprising that neither Greek scholars nor musicians know where to put their trust. At the same time such differences of opinion are quite natural; for the difficulties which beset an enquirer are many and one false step has dangerously large results. The chief points we have to bear in mind are:—

- (1) All notions derived from modern or even mediaeval music must be resolutely set aside. Neglect of this led Westphal and Gevaert into exaggerating the similarities they could trace between Greek and modern music.
- (2) Little help can be derived from the extant fragments of Greek music. They are all very mutilated or the products of the first two centuries of our era. They may be useful in checking our conclusions but by themselves they do not tell us much.
- (3) Though, commencing with Aristoxenos (320 B.C.), there are works on Greek music right down to the time of Bryennios (1350 A.D.), we have no technical writers of the period which is most important for our enquiry. For pre-Aristotelian times we have to rely mainly on musical references found in poets and philosophers who assume in their readers just that knowledge which we desire.
- (4) The quality of the later writings varies greatly. Some like Aristoxenos are fragmentary; others are really elementary handbooks, like Bakcheios and Kleonides. Some again, such as Plutarch and the passages of Athenaios are antiquarian and none too critical. Worst of all are the mathematical and speculative writers who fall under the spell of the Pythagorean theory of numbers (Gaudentios and Nikomachos).

With these preliminaries we may turn to the question: Was the ancient Greek music modal or not?

II.

There are two non-modal theories of the ἀρμονίαι, Macran's and Monro's, both of which are open to serious objections. Let us deal with Macran's first.

After describing the elementary tetrachords whose bounding notes were a perfect fourth apart, Macran proceeds: 'When this meagre group of four notes was felt to be inadequate to the expression of human emotion, a ready method for the production of a more ample scale was sought in the addition to the original tetrachord of a second, exactly similar to it. But immediately the question arose, how was the position of the second tetrachord to be determined in relation to the first? Or, to put it more generally, supposing a scale of indefinite length to be constituted of a series of similar tetrachords, how was the position of these tetrachords to be relatively defined? question it seems there were three possible answers to the theorist, each of which no doubt found support in the art product of some tribe or other of the Hellenic world. The method of determination proposed in each answer constituted a distinct ἀρμονία or Harmony, which term I believe to have meant primarily an 'adjustment' not of notes (for these are not the units of music) but of tetrachords.

The first method was one of conjunction *i.e.* the highest note of one tetrachord is coincident with the lowest note of the tetrachord immediately above it. This Macran calls the Ionic Harmony and gives it as:—

The second method is one of disjunction where there is an interval or one whole tone between the highest note of one tetrachord and the lowest note of the tetrachord immediately above it. This is designated as Doric, and written as:—

'The third method of adjustment employing conjunction and disjunction alternately, interposed a tone between every second pair of tetrachords, while every other pair were conjunct. This Harmony I shall assume to have been called Aeolian; it resulted in the following scale:

Several considerations make this theory untenable:—

- (1) Plato and Aristotle, to mention only two of the authors who refer to the  $\dot{a}\rho\mu\nu\nu'(a\iota)$ , give us the names of at least  $six~\dot{a}\rho\mu\nu\nu'(a\iota)$ .
- (2) The Aristotelian problems repeatedly state that the old ἀρμονίαι had only seven notes or strings (xix. 25, 32, 44.). But the Aeolian Harmony of Macran cannot be clearly defined in an interval less than an octave and a fourth to show the alternate conjunction and disjunction.

- (3) The assumption of a scale of indefinite length cannot be admitted. The early Greeks, using as Professor Macran believed a mere tetrachord, would scarcely make a purely imaginary and theoretical scale of indefinite length the stepping stone for progress in the musical art.
- (4) The passage of Herakleides Pontikos on which the theory ultimately rests, really proves nothing. It runs as follows:—

'Ηρακλείδης δ' ὁ Ποντικὸς ἐν τρίτω περὶ Μουσικῆς οὐδ' ἀρμονίαν φησι δεῖν καλεῖσθαι τὴν Φρύγιον, καθάπερ οὐδὲ τὴν Λύδιον, ἀρμονίας γὰρ εἶναι τρεῖς· τριὰ γὰρ καὶ γένεσθαι Ἑλλήνων γένη, Δωριεῖς, Αἰολεῖς, Ἰωνας, οὐ μικρᾶς οὖν οὔσης διαφορᾶς ἐν τοῖς τούτων ἤθεσιν . . . . τὴν οὖν ἀγωγὴν τῆς μελωδίας ἢν οἱ Δωριεῖς ἐποιοῦντο Δώριον ἐκάλουν άρμονίαν. ἐκάλουν δὲ καὶ Αἰολίδα άρμονίαν ἢν Αἰολεῖς ἦδον. Ἰαστὶ δὲ τὴν τρίτην ἔφασκον ἢν ἤκουον ἀδόντων τῶν Ἰώνων (Athenaios, 624 c).

The three ἀρμονίαι mentioned by Herakleides, the Dorian, the Aeolian and the Ionian, we know to have been the earliest, whereas the Lydian and Phrygian which Herakleides excludes were said to have been brought from Asia Minor to Greece by the followers of Pelops; <sup>2</sup> and surely Herakleides is here giving us not a piece of real evidence but an expression of a prejudiced and conservative patriotism. We must give no more weight to these remarks of Herakleides than we do to the passing claim of Plato (Laches 188 D) that the Dorian is the only true Greek ἀρμονία.

#### III.

It is not an entirely easy matter to dispose of Monro's theory which makes the effect  $(\hat{\eta}\theta_{0}s)$  of the  $\hat{a}\rho\mu\nu\nu\hat{a}\iota$  depend primarily on pitch and while not denying the existence of a shadowy modality, relegates it to an insignificant place in the aesthetic perceptions of the Greeks. But the following considerations weigh heavily against it.

(1) Monro's theory has as a corollary the supposition that the pitch of any given ἀρμονία was always the same; for otherwise the ethos would be changed and the scale lose its identity. For example, on this theory the Dorian ἀρμονία which was solemn and stately and the Phrygian which according to Aristotle was exciting (ἐνθουσιαστικός), would both be of medium pitch and the least accident of intonation would transform a solemn song into an exciting one. Did the Greeks have, or could they have had, a fixed standard of pitch? They certainly did not possess in early times any instrument to form an unalterable standard of pitch; and the only other alternative, the possession of a sense of absolute pitch, is an assumption we must not make without very strong evidence to support us. If we are guided by the analogy of Welsh, Hindu or Celtic singers we must imagine the Greek kitharode tuning his lyre just to suit the range of his own voice. This hidden corollary then is a serious obstacle to the acceptance of Monro's theory.

<sup>&</sup>lt;sup>2</sup> Pollux, Onom. iv. 65; and Athen. 625 F.

- (2) The names of the ἀρμονίαι mentioned by Plato and Aristotle are so striking that some weighty reason must be at the bottom of the matter. The application of tribal names to musical scales at once suggests that the άρμονίαι were named after the people who first used them; and our evidence goes to prove that this was the case.3 Now when a Dorian first heard a Phrygian song, the effect must have been extremely novel for him to call it distinctively Phrygian. His own apmovia was stately and disposed a man to courage; the Phrygian he found exciting. On Monro's theory these two άρμονίαι are both of medium pitch. Can we imagine the Greeks being so sensitive to the difference of a single tone? Their musical perceptions may have differed from ours, but we must be chary of believing them to have differed so vastly. Musicians can and do realise how emotional effect arises from mere pitch but they cannot conceive how one single tone could work so great a transformation of ethos. Yet this difficulty is immediately removed by the modal theory; anyone who has heard modal melodies in a Roman Catholic church will at once realise how easily the names of the Greek άρμονίαι are explained by the assumption of a modal differentiation.
- (3) We have preserved for us in several places the names of 'inventors of new  $\dot{a}\rho\mu\nu\nu\dot{a}\iota$ . Terpander invented a Boeotian, Sappho the Mixolydian and a certain Xenokritos a Locrian.<sup>4</sup> If pitch was the criterion of ethos, the invention of a new  $\dot{a}\rho\mu\nu\nu\dot{a}$  means simply stretching or slackening the strings a little more than usual, a thing which must have happened thousands of times in the ordinary process of tuning before Terpander or Xenokritos. There is no reason on Monro's theory why the names of great poets like Sappho should be so carefully preserved for so small a matter. If however we can accept the modal view, an easy explanation offers itself. The first great poet to make an extensive use of a tribal mode and secure its use in other parts of Greece was honoured by the title of 'Inventor' ( $\dot{\epsilon}\nu\rho\epsilon\tau\dot{\eta}s$ ). 'It requires great art and skill to introduce agreeably melodies to which the ear has not been accustomed; but the taking of the same melody at a different pitch is a variety for which the inventor would hardly have had his name so carefully delivered to posterity.' <sup>5</sup>
- (4) No reviewer or critic of Monro has pointed out the fatal weakness which is revealed by an examination of his authorities. It is nothing less than an inconsistency as to the pitch of the  $\dot{a}\rho\mu\nu\nu'a\iota$ . After quoting Pratinas, p. 5 (Athen. 624 F):—

μήτε σύντονον δίωκε μήτε τὰν ἀνειμέναν Ἰαστὶ μοῦσαν, ἀλλὰ τὰν μέσαν νεῶν ἄρουραν αἰόλιζε τῷ μέλει.

Monro concludes that the Aeolian was a scale of medium pitch lying between the Ionian and some other άρμονία. Yet immediately Lasos of

 $<sup>^3</sup>$  Athen. 624 c (quoted above); Pollux *Onom.* iv. 65; Bellermann, *Anon.* 28.

<sup>&</sup>lt;sup>4</sup> Schol. on Aristoph. Acharn. 14; Plutareh, De Musica, ch. 16; Callim. in Schol. on

Pindar, Ol. xi. 117.

<sup>&</sup>lt;sup>5</sup> Sir Francis Eyles Styles, *Philosoph.* Trans. 1760, vol. li. p. 755.

Hermione is quoted as saying that the Aeolian  $\dot{\alpha}\rho\mu\nu\nu\dot{\alpha}$  is deep-sounding  $(\beta a\rho\dot{\nu}\beta\rho\rho\mu\nu\nu)$ .

Again in reference to a passage of Telestes (Athen. 625 F):-

τοὶ δ' ὀξυφώνοις πηκτίδων ψαλμοῖς κρέκον Λύδιον ὕμνον.

Monro writes, 'the epithet  $\partial \xi \nu \phi \acute{\omega} \nu o \iota s$  is worth notice in connexion with other evidence of the high pitch of music known as Lydian.' But in spite of this, in quoting Plato (who labels the Ionian and Lydian  $\acute{a}\rho\mu\nu\nu\dot{\iota}a\iota$  as effeminate and convivial) he translates the epithet  $\chi a\lambda a\rho a\dot{\iota}$  as low pitched. These two discrepancies are decisive; for if pitch is the only valid criterion of ethos, we should expect the Greeks to be very certain of the pitch of any particular  $\acute{a}\rho\mu\nu\nu\dot{\iota}a$ . That they were not is a clear proof that pitch was not the essential element in the ethical effect of music.<sup>6</sup>

#### IV.

It is difficult to imagine what other theories of the ἀρμονίαι there could be except Macran's and Monro's and the older modal one. We have already shown that both Macran's and Monro's are open to serious if not to insuperable objections; but such a demonstration is not sufficient by itself to prove the modal theory; it only leads us to a more careful search for direct evidence. The following are the more important passages and considerations which lead to the the modal view.

- (1) Plato, Philebos, 17: 'Αλλ', & φιλέ, ἐπειδὰν λάβης τὰ διαστήματα ὁπόσα ἐστὶ τὸν ἀριθμὸν τῆς φωνῆς ὀξύτητός τε πέρι καὶ βαρύτητος, καὶ ὁποῖα, καὶ τοὺς ὅρους τῶν διαστημάτων, καὶ τὰ ἐκ τούτων ὅσα συστήματα γέγονεν, ὰ κατιδόντες οἱ πρόσθεν παρέδοσαν ἡμῖν τοῖς ἐπομένοις ἐκείνοις καλεῖν αὐτὰ ἀρμονίας . . . . The only meaning this passage can have is that the ἀρμονίαι were systems or scales (for σύστημα is the common word for a musical scale) which were distinguished from each other by the varied collocation of their intervals.
- (2) Plato, Nomoi, 665 D: τη δὲ της κινήσεως τάξει ρυθμὸς ὄνομα εἴη, τη δὲ αὖ της φωνης, τοῦ τε ὀξέος ἄμα καὶ βαρέος ξυγκεραννυμένων, ἀρμονία ὄνομα προσαγορεύοιτο. This is a rather vague statement but clearly does not refer a ἀρμονία to pitch but to the mingling of high and low notes. Bearing in mind the reference to highness and lowness in the preceding Philebos passage we may assume Plato had the same kind of idea running through his mind here.

meaning, most of Monro's evidence for his theory disappears.

<sup>&</sup>lt;sup>6</sup> There is no need or real reason to refer the words σύντονος, ἀνειμένος and χαλαρός to pitch at all (cf. H. S. Jones, C.R. 1894). If we agree with Monro that they do refer to pitch we are faced with the above *impasse*; if on the other hand we give them an ethical

<sup>7</sup> Cf. Synesios (apud Vincent, Notices, p. 283): ὥσπερ ἡ λύρα σύστημα φθόγγων ἐστι ἀντιφώνων τε καὶ συμφώνων τὸ δὲ ἐξ ἀντικειμένων ἐν άρμονία, καὶ λύρας καὶ κόσμου.

- (3) The Pythagorean theory of the soul as a  $\dot{a}\rho\mu\nu\nu\dot{a}$  (cf. Plato, Phaedo 86 B 7-C 5), so far as it is related to music points distinctly to the modal theory. The soul of a good man was not more highly strung than the soul of a bad man; its constituents were merely better attuned and in proportion. As the Dorian scale resulted from the best tuning or 'fitting' of the lyrestrings ( $\dot{a}\rho\mu\nu\nu\dot{i}a$ ), so the best man was the result of the best fitting of the constituents of his soul. A man might be amatory, warlike or effeminate, but it was not his soul as a whole which was more or less highly strung; the difference lay in the altered relations of the parts of the soul to one another. In the same way one scale might dispose a man to courage, like the Dorian, or have a relaxing effect like the Lydian or Ionian. The intervals were the same in each case but the alteration in their collocation gave rise to the different effects.
  - (4) Aristophanes, Knights, 985:

'Αλλὰ καὶ τόδ' ἔγωγε θαυμάζω τῆς ὑομουσίας
αὐτοῦ· φασὶ γὰρ αὐτὸν οἱ
παῖδες οἱ ξυνεφοίτων,
τὴν Δωριστὶ μονὴν ἃν άρμόττεσθαι θαμὰ τὴν λύραν,

άλλην δ' οὐκ ἐθέλειν μαθεῖν·
κἆτα τὸν κιθαριστὴν
ὀργισθέντ' ἀπάγειν κελεύειν, ὡς ἀρμονίαν ὁ παῖς
οὖτος οὐ δύναται μαθεῖν
ἢν μὴ Δωροδοκιστί.

One has to be careful in extracting precise information from the quips and jokes of a comic poet, but surely beneath this jibe of Aristophanes it is not fanciful to see the fact that the learning of a new  $\dot{a}\rho\mu\nu\nu\dot{a}$  required some effort on the part of a student. Why? Clearly not because of a mere difference of pitch. No Athenian boy would be so incompetent as not to be able to tighten up the strings of his lyre or kithara as a whole: the turning of the crossbar would effect that. But to tune the lyre to a new modal scale, where individual strings had to be altered, might conceivably have caused difficulty to a boy of abnormal musical taste and perceptions.

(5) Aristotle, Politics, iii. 3, 1276 B: Εἴπερ γὰρ ἐστι κοινωνία τις ἡ πόλις, ἔστι δε κοινωνία πολιτῶν πολιτεία, γενομένης ἑτέρας τῷ εἴδει καὶ διαφερούσης τῆς πολιτείας ἀναγκαῖον εἶναι δόξειεν ἂν καὶ τὴν πόλιν μὴ εἶναι τὴν αὐτὴν, ὥσπερ γε καὶ χορὸν ότὲ μὲν κωμικὸν ότὲ δὲ τραγικὸν ἔτερον εἶναι φαμεν τῶν αὐτῶν πολλάκις ἀνθρώπων ὄντων, ὁμοίως δὲ καὶ πᾶσαν ἄλλην κοινωνίαν καὶ σύνθεσιν ἕτερον, ἂν εἶδος ἕτερον ἢ τῆς συνθέσεως, οἷον ἀρμονίαν τῶν αὐτῶν φθόγγων ἑτέραν λέγομεν ότὲ μὲν ἢ Δώριος ότὲ δὲ Φρύγιος.

This passage (first quoted by Professor Cook Wilson) is far from definite but can only be explained on the modal theory. Literally  $\tau \hat{\omega} \nu$   $\alpha \hat{\upsilon} \tau \hat{\omega} \nu$   $\phi \theta \hat{\upsilon} \gamma \gamma \omega \nu$  is meaningless. If however  $\phi \theta \hat{\upsilon} \gamma \gamma \sigma \sigma$  means 'a note of a certain name' such as Mese or Paramese, without defining any functional value but merely the position of the corresponding string on the lyre, the passage becomes highly conclusive.

(6) Aristotle, Politics, viii. 7, 1342 Β: Φιλόξενος ἐγχειρήσας ἐν τῆ Δωριστὶ ποιῆσαι διθύραμβον ΤΟΥΣ ΜΥΣΟΥΣ οὐχ οἰος τ' ἦν ἀλλ' ὑπὸ

τῆς φύσεως αὐτῆς ἐξέπεσεν ἐς τὴν Φρυγιστὶ τὴν προσήκουσαν ἀρμονίαν πάλιν. This very important passage points unmistakably to modality and not to pitch as the criterion of ethos. It is not a matter here of extempore playing on the part of Philoxenos, but of deliberate composition. If pitch had been the only difficulty, transposition would have removed the trouble; in which case Aristotle would not waste his time relating the incident. As a modern analogy, we may remark that funeral marches are generally in the minor mode; but Händel's march in 'Saul' is in the major. Philoxenos tried some such tour de force, but failed.

- (7) Valuable inferences may be drawn from a consideration of the topics dealt with in the fragments of the Harmonics of Aristoxenos. He divides the science of Harmonic (Chap. 35-38) into seven parts: genera, intervals, notes, scales, keys, modulation and the construction of melody. 'The fourth part' he says,8 'will consider scales firstly as to their number and nature, secondly as to the manner of their construction from the intervals and notes. . . . Our predecessors either made no attempt at all at enumeration of scale distinctions, confining themselves to the seven octave scales which they called Harmonies (apportai); or if they made the attempt they fell short of completeness, like the school of Pythagoras of Zacynthus and Agenor of Mitylene. . . . The fifth part of our science deals with the keys in which the scales are placed for the purposes of melody.' Thus Aristoxenos clearly considered the apportar as 'systems' and quite distinct from the τόνοι or keys, which differed solely in pitch. That the systems were defined by the succession of intervals is implied earlier in the work (chap. 6). 'As we then observed all the scales with the exception of one have been completely passed over; and of that one system Eratokles merely endeavoured to enumerate the figures of one magnitude, namely the octave, empirically determining their number, without any attempt at demonstration by the recurrence of intervals.' These passages of the chief musical theorist of antiquity leave no doubt that the ἀρμονίαι were scales differing in the succession of the intervals composing them.
- (8) Cicero, *Tusculan Disputations*, i. 18: Harmoniam autem ex intervallis sonorum nosse possumus, quorum varia compositio etiam harmonias efficit plures.

This is a lucid confirmation of the Greek passages given above. It may be said that Cicero is rather a late author to quote as an authority on so important a matter; but his old tutor Poseidonios was no mean musician (Athen. 635 c) and from him Cicero no doubt obtained much of that musical knowledge which is found somewhat frequently in the *Tusculans*.

(9) To clinch the argument, a passage from Plutarch's De Musica (chap. 16, 1136 d) is perhaps of more importance than any other quotation of an ancient author. 'Αριστόξενος δὲ φησι Σαπφὼ πρώτην εὕρασθαι τὴν Μιξολυδιστὶ, παρ' ἡς τοὺς τραγωδοποιοὺς μαθεῖν λαβόντας γοῦν αὐτους συζεῦξαι τῆ Δωριστὶ, ἐπεὶ ἡ μὲν τὸ μεγαλοπρεπὲς καὶ ἀξιωματικὸν ἀποδί-

<sup>&</sup>lt;sup>8</sup> Macran's translation.

δωσιν, ἡ δὲ τὸ παθητικόν, μέμικται δὲ διὰ τούτων τραγφδία· αὖθις δὲ Λαμπροκλέα τὸν ᾿Αθηναῖον συνιδόντα, ὅτι οὐκ ἐνταῦθα ἔχει τὴν διάξευξιν, ὅπου σχεδὸν ἄπαντες ἄοντο, ἀλλ᾽ ἐπὶ τὸ ὀξύ, τοιοῦτον αὐτῆς ἀπεργάσασθαι τὸ σχῆμα οἶον τὸ ἀπὸ παραμέσης ἐπὶ ὑπάτην ὑπατῶν. ᾿Αλλὰ μὴν καὶ τὴν Ἐπανειμένην Λυδιστί, ἥπερ ἐναντία τῆ Μιξολυδιστί, παραπλησίαν οὖσαν τῆ Ἰάδι ὑπὸ Δάμωνος εὑρῆσθαι φησι τοῦ ᾿Αθηναίου. Here we find the Mixolydian ἀρμονία determined not by its pitch but by the relative position in it of a certain distinctive tone-interval; and furthermore a Lydian scale is recognised as having its succession of intervals just in the reverse order of those of the Mixolydian. The schemes of the two scales, in the diatonic 'genus,' must have been:—

Mixolydian ... ... S T T S T T Epaneimene Lydisti ... T T T S T T S

We shall find later that these 'schemes' are confirmed from other sources, but for the present it is sufficient to point out how remarkable is the support which this passage gives to the modal theory. When we remember that it comes actually from the pen of Aristoxenos himself can any doubt remain about the validity and truth of the modal theory of the  $\dot{a}\rho\mu\nu\nu'a\iota$ ?

V.

After the preceding survey of the evidence relating to the  $\dot{\alpha}\rho\mu\nu\nu\dot{\iota}\alpha\iota$ , we can come to some conclusion. Macran's theory of three ἀρμονίαι is built up on a very meagre portion of the available evidence, and is entirely refuted by the remainder. Monro's theory is more formidable, and at first sight all the evidence seems to go in its favour. The words σύντονος and ἀνειμένος so often repeated in the earlier authorities seem to point distinctly to pitch as the distinguishing feature of the various scales. Yet a closer examination of the theory reveals inherent improbabilities, and a consideration of the evidence for it shows fatal discrepancies. On the other hand, the modal view is supported more or less strongly by half a score of quotations, and the passages which seem to contradict it can be solved without any violent Accordingly, we must admit that the Greek άρμονίαι manipulation. mentioned by early writers derived their emotional and ethical effect on listeners fundamentally from the varying succession of the tones and semitones composing them. In other words, the apportal were actually modes. At the same time we must beware of attributing to them, as Westphal and Gevaert did, as elaborate a structure as we find in the mediaeval modes. Our evidence is not sure enough for us to say whether or not they possessed

<sup>&</sup>lt;sup>9</sup> Mr. Denniston (Cl. Quart. 1913) quotes three passages which seem to fix all scales to one scheme; but in every one of these cases it can be shown that Pythagorean influences have been at work and that only the Dorian ἀρμονία is in view. The evidence for the

modal theory is far too weighty to be upset by three passages for which an easy explanation presents itself (cf. Gevaert, Les Problèmes Musicaux d'Aristote, p. 167; and Weil and Reinach's Plutarque: de la Musique, p. 92, n. 226).

a definite melodic Final or Dominant (or reciting note), such as the liturgical scales possess. Of this one point, however, we may be sure: as far as a varied succession of intervals is concerned they were essentially modes.

Yet such a conclusion does not tell us much about the  $\dot{a}\rho\mu\nu\nu'(a\iota)$  as they were in actual use. Two further questions of no small importance arise: even granting that pitch was not the basis of the  $\dot{a}\rho\mu\nu\nu'(a\iota)$ , may not the modes still have differed from one another in pitch? Secondly, what was the series of intervals which composed a given  $\dot{a}\rho\mu\nu\nu'(a)$ ?

The first question has never been properly discussed. Most writers assume quite arbitrarily that there was or was not a more or less important difference of pitch between the various ἀρμονίαι. There is only one passage of Aristotle which has anything definite to say on the matter, and it is sometimes adduced as proof that there was a difference of pitch. It runs as follows (Politics, viii. 7, 1342 в 20): 'Thus for those whose powers have failed through years it is not easy to sing the σύντονοι scales; their time of life naturally suggests the use of the ἀνειμέναι.' Monro remarks: 'In this passage the meaning of the words σύντονος and ἀνειμένος is especially clear. But this passage cannot possibly refer to pitch for the following reasons:—

- (1) If pitch alone is the difficulty, there would be no need to *teach* boys these modes. Old age would be the only master necessary.
- (2) Aristotle has been mentioning  $\hat{\eta}\theta$ os only two lines before. Ought we not to refer the words  $\sigma\dot{\nu}\nu\tau\sigma\nu\sigma$  and  $\dot{a}\nu\epsilon\iota\mu\dot{\epsilon}\nu\sigma$  to ethos also?
- (3) As a matter of fact, old men cannot sing low-pitched songs better than high-pitched ones; they find difficulty in singing any except medium-pitched ones. A man who in the prime of life was a tenor does not become a bass singer when he grows old; he remains a tenor, but loses some of his range at both ends of his voice.
- (4) The Greeks thought that old men sang and spoke in a *shrill* voice. Several of the Aristotelian Problems mention the fact (xi. 3, 34, 40, 62).

The truth of the matter seems to be that some intervals and successions of intervals are more difficult to sing than others, and impose a greater strain on the vocal organs. Doh to La is always hard to sing; Doh-Te-Doh is easy. The meaning of Aristotle is that the melodies drawn from the  $\dot{\alpha}\nu\epsilon\iota\mu\dot{\epsilon}\nu\alpha\iota$  modes contained successions of intervals which did not tax the voice severely and were therefore suitable for old men in spite of their ethical qualities.

Accordingly we must leave the question of the pitch of the various  $\acute{a}\rho\mu\nu\nu la\iota$  with a 'non liquet.' Common-sense would seem to indicate however that each individual singer sang all the modes at about the same pitch and chose the pitch to suit the best compass of his own voice. Beyond that we cannot safely go.

#### VI.

By far the most important question relating to the  $\dot{a}\rho\mu\nu\nu\dot{a}\iota$ , once we have established that they were modes, is to define the successions of intervals which constitute a given  $\dot{a}\rho\mu\nu\nu\dot{a}\iota$ . In dealing with this part of the subject

we have to remember two very important facts. In the first place the  $\dot{a}\rho\mu\sigma\nu\dot{a}a$  were quite old in the time of Plato and had existed for centuries without being defined by any rigid theory. They were in essence the tunings of the lyre necessary to play tribal melodies and not text-book scales. We must not expect to find them logically constructed and scientifically arranged. Secondly, the existence of the 'genera' has to be borne in mind continually. According to the theory of the 'genera,' a perfect fourth was variously divided in six principal ways at least:—

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Enharmonic... ... \frac{1}{4} \frac{1}{4} 2 (= a perfect fourth) μαλακός Chromatic ... \frac{1}{3} \frac{1}{3} 1\frac{5}{6} ,, ,, ,, ,, \frac{5}{4} ημιόλιος ,, ... \frac{3}{8} \frac{3}{8} 1\frac{3}{4} ,, ,, ,, ,, τονιαῖος ,, ... \frac{1}{2} \frac{1}{2} 1\frac{1}{2} ,, ,, ,, μαλακός Diatonic ... \frac{1}{2} \frac{3}{4} 1\frac{1}{4} ,, ,, ,, ,, σύντονος ,, ... \frac{1}{2} 1 1 ,, ,, ,, ,,
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Some if not all of these 'genera' were actually used and though it makes for simplicity of exposition to ignore their existence, it does not give us anything like a true idea of the nature of early Greek music.

We have already seen how Aristoxenos spoke of the seven octavesystems which were called  $\dot{a}\rho\mu\nu\nu\dot{\iota}a\iota$ . He himself in his revised theory preferred to call them more scientifically  $\epsilon\ddot{\iota}\delta\eta \tau o\hat{\upsilon} \delta\iota\dot{a} \pi a\sigma\hat{\omega}\nu$ ; and the forms in which he gave them are preserved for us in the 'Eisagoge' of Kleonides, the chief Aristoxenian writer of later antiquity. The list is:—

				D	iator	iic						Enh	arm c	onic		
Mixolydian		$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	${f T}$	$\mathbf{or}$	$\frac{1}{4}$	$\frac{1}{4}$	2	$\frac{1}{4}$	$\frac{1}{4}$	2	1
Lydian	•••	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	,,	$\frac{1}{4}$	$\dot{2}$	$\frac{1}{4}$	$\frac{1}{4}$	$ar{2}$	1	$\frac{1}{4}$
Phrygian	• • •	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	,,	2	$\frac{1}{4}$	$\frac{\overline{1}}{4}$	2	1	$\frac{1}{4}$	$\frac{1}{4}$
Dorian	• • •	$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	${f T}$	"	$\frac{1}{4}$	$\frac{1}{4}$	2	1	$\frac{1}{4}$	$\frac{1}{4}$	<b>2</b>
Hypolydian	•••	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	,,	$\frac{1}{4}$	$ar{2}$	1	$\frac{1}{4}$	$\frac{1}{4}$	$ar{2}$	$\frac{1}{4}$
Hypophrygian		$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	,,	<b>2</b>	1	$\frac{1}{4}$	$\frac{1}{4}$	$\overline{2}$	$\frac{1}{4}$	$\frac{1}{4}$
Hypodorian		$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	$\mathbf{S}$	$\mathbf{T}$	$\mathbf{T}$	,,	1	$\frac{1}{4}$	$\frac{1}{4}$	$ar{2}$	$\frac{1}{4}$	$\frac{1}{4}$	$\hat{2}$

But besides this list which is found in other writers as well as in Kleonides, there is a second preserved in a famous passage of a writer of the second century A.D., Aristides Quintilianus. In the course of a discussion of the division of the tetrachord into 'genera' he jots down a series of scales which he says the old Greeks of  $\pi \acute{a}\nu\nu$   $\pi a\lambda ai\acute{o}\tau a\tau oi$  used as  $\acute{a}\rho\mu o\nu\acute{a}i$  and definitely asserts that of these Plato made mention in the Republic. They are as follows:—

Lydian	• • •	• • •	$\frac{1}{4}$	<b>2</b>	1	$\frac{1}{4}$	$\frac{1}{4}$	2	$\frac{1}{4}$	
Dorian	•••	• • •	1	$\frac{1}{4}$	$\frac{1}{4}$	<b>2</b>	1	$\frac{1}{4}$	$\frac{1}{4}$	2
Phrygian		• • •	1	$\frac{1}{4}$	$\frac{1}{4}$	2	1	$\frac{1}{4}$	$\frac{1}{4}$	1
Ionian	•••	• • •	$\frac{1}{4}$	$\frac{1}{4}$	2	$1\frac{1}{2}$	1			
${\bf Mixoly dian}$	• • •	•••	$\frac{1}{4}$	$\frac{1}{4}$	1	1	$\frac{1}{4}$	$\frac{1}{4}$	3	
Syntonolyd	ian		$\frac{1}{4}$	$\frac{1}{4}$	<b>2</b>	$1\frac{1}{2}$				

The definite claim Aristides makes for these scales and the remarkable difference between them and the normal list warn us to be sure of their authenticity before accepting them. Gevaert never thinks of doubting them, Laloy believes that Aristides had access to the lost pre-Aristoxenian theory books but Monro rejected the evidence of Aristides. For the following reasons it is impossible to do other than accept them:—

- (1) Though the passage is a digression, it is not as Monro says a crude interpolation. The scales are distinctly given as curious examples of the use of the enharmonic quarter-tone in the old scales. Their insertion arises naturally from the context and at the end Aristides calls attention again to the small interval (p. 21: δίεσιν δὲ νῦν ἐπὶ πάντων ἀκουστέον τὴν ἐναρμόνιον).
- (2) He is quite aware that these scales differ from the normal list which he himself had already given (p. 17). Some, he says, do not reach to a full octave and he promises to explain why later. The fact that the promise is not fulfilled is rather in favour of the genuineness of the passage than otherwise.
- (3) We have seen that a certain Lamprokles of Athens became famous for demonstrating the real theoretical structure of the Mixolydian  $\dot{\alpha}\rho\mu\nu\nu\dot{\iota}\alpha$ . Now the most remarkable scale of Aristides is the Mixolydian with its undivided three-tone interval at the top which obscures the true position of the 'disjunctive tone.' It was Lamprokles we may believe who first ascertained the theoretical division of this large interval.
- (4) The much mutilated fragment of the *Orestes* of Euripides affords strong support for these scales. It is one of the oldest pieces of Greek music which we possess, and the intervals it uses coincide absolutely with the six lower intervals of the Phrygian scale of Aristides.
- (5) More striking still is the evidence found in Mr. Abdy Williams' paper on some musical instruments found at Pompeii (Cl. Rev. 1903, p. 409). One of the instruments, a kind of primitive organ (probably a  $\pi\tau\epsilon\rho\sigma\nu$ ) gives the sequence of intervals:—

$$\frac{1}{2}$$
  $\frac{1}{2}$  1  $\frac{1}{2}$  2  $(\frac{1}{4}$   $\frac{1}{4}$  2  $1\frac{1}{2}$  1)

The sequence in brackets agrees entirely with the Ionian of Aristides and we are told by an ancient writer that one of the scales used on such an instrument (the  $\pi\tau\epsilon\rho\sigma\nu$ ) is actually the Ionian! It is impossible to reject the evidence of Aristides after such considerations as these.

We can now compare the scales of Aristides with the normal list and draw some interesting conclusions.

(1) The Mixolydian of Kleonides and that of Aristides tally thus:—

Kleonides ... 
$$\frac{1}{4}$$
  $\frac{2}{1}$   $\frac{1}{4}$   $\frac{1}{4}$   $\frac{2}{3}$  Aristides ...  $\frac{1}{4}$   $\frac{1}{1}$   $\frac{1}{1}$   $\frac{1}{4}$   $\frac{1}{4}$   $\frac{3}{3}$ 

(2) The Dorian corresponds as:—

Kleonides ... 
$$-\ \frac{1}{4}\ \frac{1}{4}\ 2\ 1\ \frac{1}{4}\ \frac{1}{4}\ 2$$
  
Aristides ...  $1\ \frac{1}{4}\ \frac{1}{4}\ 2\ 1\ \frac{1}{4}\ \frac{1}{4}\ 2$ 

The additional tone at the bottom of the Dorian of Aristides is worth particular notice; its significance will be explained later.

(3) The Hypolydian elos of Kleonides is the same scale as the Lydian of Aristides:—

Kleonides (Hypolydian) ... 
$$\frac{1}{4}$$
 2 1  $\frac{1}{4}$  2  $\frac{1}{4}$  Aristides (Lydian) ...  $\frac{1}{4}$  2 1  $\frac{1}{4}$  2  $\frac{1}{4}$ 

Apparently the Lydian of Plato with the advance of theory and the introduction of the scientific arrangement into Hypo-modes, changed its name. We find Plutarch (c. 16) referring to it as the Epaneimene Lydisti.

(4) The two Phrygian scales do not correspond as they stand; but Monro has already pointed out that the scale of Aristides is really related to the diatonic form of Kleonides. Comparing we obtain:—

Kleonides (Diatonic) ... 
$$1$$
  $\frac{1}{2}$   $\frac{1}{4}$   $\frac{1}{4}$   $\frac{1}{2}$   $1$  Aristides (Enharmonic) ...  $1$   $\frac{1}{4}$   $\frac{1}{4}$   $\frac{1}{4}$   $\frac{1}{2}$   $1$ 

(5) The Syntonolydian of Aristides is a very imperfect scale but it corresponds in some measure with the Diatonic Lydian of Kleonides:—

Kleonides (Diatonic Lydian) ... 
$$1$$
  $1$   $\frac{1}{2}$   $\frac{1}{4}$   $\frac{1}{4}$   $\frac{1}{2}$  Aristides (Syntonolydian) ...  $\frac{1}{4}$   $\frac{1}{4}$   $\frac{1}{2}$ 

Thus it seems that the so-called Syntonolydian of Plato's Republic was known later as simply the Lydian.

(6) Though we know that the old Ionian ἀρμονία was called the Hypophrygian in later times (cf. Boeckh, De Metris Pindari, ii. 8) very little correspondence can be found between the two scales:—

(7) Kleonides gives seven octave species but Aristides gives six  $\dot{a}\rho\mu\nu\nu\ell\alpha\iota$  only. The remaining species is the Hypodorian. From Athenaios (624 E) we learn that this species was the same as an old Aeolian  $\dot{a}\rho\mu\nu\nu\ell\alpha$  which Plato did not discuss and Aristides therefore does not mention.

These ἀρμονίαι, we must remember, were a spontaneous growth due to a people keenly intent on expressing its emotions in the natural medium of song. In reality they had no existence except as the sources from which melody was drawn; the tuning of the lyre for a Lydian song was known as the Lydian ἀρμονία and the scale which resulted was called the Lydian ἀρμονία was not realised nor the relation it bore theoretically to any other ἀρμονία. It was only when the theorists commenced their work that these scales were written down as independent phenomena. Lasos of Hermione the first theorist lived about 500 B.C.; but of his work we know little. A quarter of a century later Lamprokles of Athens distinguished himself by deciding the real theoretical structure of the Mixolydian ἀρμονία; and during the lifetime of Sokrates another Athenian, Damon, did the same for the Lydian scale of Plato. These and other theorists did not invent

the scales; they endeavoured to find some principle of structure in them and on that basis to complete those scales which were defective. The culmination of this classification of the  $\dot{\alpha}\rho\mu\nu\nu'i\alpha\iota$  is found in the work of Aristoxenos (320 B.C.). Now the scales of Aristides are the  $\dot{\alpha}\rho\mu\nu\nu'i\alpha\iota$  as they existed before the work of classification was complete, whereas the scales of Kleonides are the  $\dot{\alpha}\rho\mu\nu\nu'i\alpha\iota$  seen in the light of Aristoxenian theory. The scales of Aristides are of the utmost importance for the study of Greek music and from them we can obtain a very fair idea of what Greek music was like in the days before Plato.

- (1) We have to acknowledge, what the 'Orestes' fragment and the hymns found at Delphi lead us to suspect, that ancient Greek music would sound utterly barbaric to our modern ears. The quarter-tone interval which was used so frequently is unknown to us in Western Europe and its importance must not be under-estimated. The simplest melody which contained it would be unintelligible to us.
- (2) A άρμονία was not confined to one single 'genus' as we see from the Phrygian and Syntonolydian scales of Aristides. There the enharmonic diesis is used but the internal structure of the scale is decidedly diatonic. The later theorists would not lead us to suspect that such was the usual state of affairs but it seems that it was actually so.
- (3) The old scales (and consequently the melodies written in them) did not always extend to a full octave nor were their intervals evenly distributed. Of these phenomena the Mixolydian and Syntonolydian are good examples.

Even though we should be unable to appreciate ancient Greek music we must not assume that it was an inferior or undeveloped form of art. It was vastly different from our own but it expressed for the Greeks quite as much as our modern music does. They found it capable of influencing character, and an art which can do that is not to be derided because we are unaccustomed to its peculiar idiom.

#### VII.

In order to trace the modal structure of Greek music still further we must digress a little into the history of Greek musical instruments, of which the lyre and kithara are for our present purpose the most important. From the strings of these instruments the notes of the scale originally took their names; the Hypate, Mese and Nete being in reality the highest, middle and lowest strings on the lyre in point of position, and the Lichanos the string played by the first finger. The very old lyre had seven strings only, a number which was regarded as semi-sacred. The first break with the old order was made about 520 B.C. by Pythagoras (we are told) who added to the lyre an eighth string and thus obtained for his diatonic Dorian scale:—

## E F G A B C D E

and within a hundred years of this date, string instruments had increased to at least eleven strings.<sup>10</sup> The flute too, was improved during these years. Previously separate flutes had been used for the various scales, but a certain Pronomos of Thebes invented a flute to play the Dorian, Lydian and Phrygian.<sup>11</sup> Furthermore we have in this period the rise of theory on the part not only of the Pythagorean school but also of important musicians like Lasos or Hermione and Lamprokles and Damon of Athens.

We must not imagine, however, that these innovations were any more favourably received than those of later progressive musicians like Wagner and Debussy. Philoxenos, Timotheos and Pronomos were severely censured as offering an insult to the Muses and debasing the purity of art. Plato in particular objected to the new movements in music and definitely rejected for his ideal State those instruments which were adapted for playing all the modes (Rep. 399 c). And even by the time of Aristoxenos some of the conservative spirits had not become reconciled to the revolution which had taken place.

We shall understand these advances better if we keep in mind the list of modal scales as given by a later theorist like Kleonides (cf. supra). Let us imagine a musician with a seven-stringed lyre tuned to the diatonic Dorian  $\dot{a}\rho\mu\nu\nu\dot{a}$  as:—

E F G A B C D (E).

If he desires to play a Phrygian melody he has to retune some of his strings to obtain a sequence: T S T T T S T; this he effects by raising the F and C each a semitone, assuming of course that the strict diatonic 'genus' is contemplated. The scale which Plato calls the Lydian (later Hypolydian) needs no less than five strings changed; and in the mixture of 'genera' which Aristides gives us in his list, the matter becomes even more complicated. This alteration and fitting of strings into a new scale was the origin of the term  $\dot{a}\rho\mu\nu\nu\dot{a}$  as applied to music. The addition however of an eighth string to complete the octave and a ninth string placed a fifth below the Mese or middle string, opened up a new era, for the new instrument can now be tuned:—

DEFGABCDE

The octave E-E gives as before the diatonic Dorian  $\dot{a}\rho\mu\nu\nu\dot{a}$ , but what of the octave D-D? Its scheme or species  $(\sigma\chi\hat{\eta}\mu a \text{ or }\epsilon\hat{i}\delta\sigma_{s})$  is:—

#### TSTTST

which corresponds with the scheme of the diatonic Phrygian άρμονία.<sup>14</sup> Ι

scales in modern nomenclature are not intended as an implication of the actual pitch of Greek scales, but are used partly in deference to a tradition which has grown up in the study of the subject, partly to avoid the excessive use of accidentals. On the subject of the exact pitch of Greek scales, cf. F. Greif's brilliant article in the Revue des Études Greeques, 1909, p. 90 ff.

<sup>10</sup> Cf. Weil and Reinach's exhaustive notes: Plutarque, de la Musique, p. 119. On the whole of this section, cf. Curtis, J.H.S.

<sup>11</sup> Athen. 631 E; and Paus. ix. 12, 5.

<sup>&</sup>lt;sup>12</sup> Athen. 636 E; Paus. iii. 12, 10; Plutarch, De Mus. 1135 D, 1141 D.

<sup>&</sup>lt;sup>13</sup> For this ninth string, 'hyperhypate' or 'diapemptos,' cf. Vincent, *Notices*, p. 254.

<sup>&</sup>lt;sup>14</sup> The Dorian octave E-E and the other

seems that the Greeks at first did not realise clearly that the Phrygian  $\dot{a}\rho\mu\nu\nu\dot{\iota}a$  was here reproduced a tone lower as a whole, but considered the additional note as an extension of the Dorian  $\dot{a}\rho\mu\nu\nu\dot{\iota}a$ . Consequently in the old scales which Aristides has preserved we find the lower D, making an interval of a tone with the real hypate of the Dorian, included in that  $\dot{a}\rho\mu\nu\nu\dot{\iota}a$ . When however the Greeks did perceive what the added note really meant they were not slow to make use of the principle there found. Thus by the time of least of Aristoxenos they possessed a long two-octave scale which was known technically as the Greater Perfect System. It was:—

#### $\mathbf{A} \ \mathbf{B} \ \mathbf{C} \ \mathbf{D} \ \mathbf{E} \ \mathbf{F} \ \mathbf{G} \ \mathbf{A}' \ \mathbf{B}' \ \mathbf{C}' \ \mathbf{D}' \ \mathbf{E}' \ \mathbf{F}' \ \mathbf{G}' \ \mathbf{A}''$

It was seen that the octave B-B' gave a scale similar to the Mixolydian  $\dot{a}\rho\mu\nu\nu\dot{a}$ ; C-C' a scale similar to the so-called Syntonolydian  $\dot{a}\rho\mu\nu\nu\dot{a}$  and D-D' one similar to the Phrygian. E-E' was actually the Dorian  $\dot{a}\rho\mu\nu\nu\dot{a}$ , the nucleus of the whole two octave scale. F-F' gave a scale approximating to the old Lydian; G-G' one like the Ionian and A'-A" one like the Aeolian. Yet these scales could not be correctly called  $\dot{a}\rho\mu\nu\nu\dot{a}\iota$ , since there was no retuning necessary; and the word  $\dot{a}\rho\mu\nu\nu\dot{a}\iota$  itself was unsatisfactory for other reasons. It was applied by the Pythagoreans exclusively to their perfect Dorian scale and at the same time was used to denote the enharmonic 'genus.' Accordingly, before the time of Aristoxenos the word dropped out of use in its distinctive sense of a modal scale in favour of the more scientific term 'octave-species' ( $\dot{e}i\delta\eta$   $\tau o\hat{\nu}$   $\delta\iota\dot{a}$   $\pi a\sigma\hat{\omega}\nu$ ). At the same time the relation of the various octave-species to one another was better apprehended. Some were seen to be a perfect fourth above or a perfect fifth below others in the general scale. They accordingly fell into two groups thus:—

The Mixolydian was one apart by itself but the relation between the others was indicated by the use of the term 'Hypo.' The Aeolian became the Hypodorian, the Syntonolydian was known simply as the Lydian and the old Lydian of Plato as the Hypolydian. The Ionian became the Hypophrygian.<sup>15</sup>

Parallel to this development of the lyre and the evolution of the 'octave-species' there arose inevitably a series of scales known as  $\tau \acute{o}\nu o\iota$ . The advantage of a less frequent tuning derived from the use of the  $\epsilon i \delta \eta$  was not an unmixed blessing. In the case of the Phrygian and the old Lydian no difficulty arose from the fact that the range of the voice in singing was extended; a few notes at the top or bottom of the voice did not make much difference. But when it came to the Mixolydian the voice had to descend to B; for the Aeolian it had to ascend to the top A". D-D' or F-F' was fairly well within the normal part of the voice, which we have already assumed for the sake of example to have been E-E'; but B-B' was

<sup>15</sup> For separate confirmation of these identifications, cf. Boeckh, De Metris Pindari, ii. and Athen. 624 E.

going rather low while G-G' was somewhat high. What was to be done? Changing strings for a new  $\dot{a}\rho\mu\nu\nu\dot{a}$  was troublesome and the great advantage of the  $\epsilon\dot{i}\delta\eta$  had been the avoidance of that difficulty; yet the sacrifice of the best part of the voice was not to be thought of. The solution which the Greeks gave to the difficulty was a simple and effective compromise. If the section of the long scale which they desired to use for a modal melody were too low to sing comfortably they raised the pitch of the kithara as a whole in order to bring the required section into range. If the section containing the  $\epsilon\dot{i}\delta\sigma$  were too high they lowered the pitch of the kithara as a whole. A turn of the cross-bar would suffice to effect this change and prove far less tedious than the retuning of several strings. In the scale:—

The Dorian octave E-E' was fairly well in the middle range of the voice, let us say; but the old Syntonolydian from C-C' was somewhat low. By raising the whole scale two tones this Syntonolydian section was brought within the limits E-E', thus:—

Similarly the Hypophrygian was rather high as an octave-species and the kithara had to be lowered as a whole to bring the section into a suitable range, thus:—

$$F \sharp \ G \sharp \ A \ B \ C \sharp \ D \ E \ F \sharp \prime \ G \sharp \prime \ A' \ B' \ C \sharp \prime \ D' \ E' \ F \sharp \prime \prime$$

Such a raising or lowering of the kithara as a whole would be quite naturally called a  $\tau \acute{o}\nu o\varsigma$  or 'tightening up' and the alteration necessary to bring the Hypophrygian species into the normal range would be called the Hypophrygian  $\tau \acute{o}\nu o\varsigma$ . We should therefore expect to find that the higher a species is in the typical general scale, the lower-pitched relatively is the  $\tau \acute{o}\nu o\varsigma$  of the same name; and that the octave-species found between certain absolute limits in any  $\tau \acute{o}\nu o\varsigma$  would be the species bearing the same name as the  $\tau \acute{o}\nu o\varsigma$ . These expectations are amply satisfied by the actual facts. The two subjoined lists give the  $\epsilon i \acute{o}\eta$  written in the ascending order of pitch as they stand on the two-octave scale of the Perfect System and the  $\tau \acute{o}\nu o\iota$  also in ascending order of pitch.

σχήματα ο			τόνοι						
Mixolydian	•••	(B-B)	Hypodorian	•••	(con	nmencii	ng on F)		
Lydian	• • •	(C-C)	Hypophrygian		(	,,	" G)		
Phrygian		(D-D)	Hypolydian		Ì		" A)		
Dorian		(E-E)	Dorian			,,	" B <b>þ</b> )		
Hypolydian	•••	(F-F)	Phrygian		•	,,	" C)		
Hypophrygian			Lydian		`	,,	" D)		
Hypodorian	•••	(A-A)	Mixolydian		`	"	" Eþ)		

Thus the order of the  $\tau \acute{o}\nu o\iota$  is just the reverse of that of the corresponding  $\epsilon i\acute{o}\eta$ , a perfectly natural consequence but a phenomenon which, as we shall see later, led to an inextricable confusion in mediaeval times.

Furthermore, if we take the seven  $\tau \acute{o}\nu o\iota$  named and in each  $\tau \acute{o}\nu o\varsigma$  we select the octave F-F, we find that the species obtained is the species of the same name as the  $\tau \acute{o}\nu o\varsigma$ . <sup>16</sup>

The most important point about these  $\tau \acute{o}\nu o\iota$ , however, is that they arose directly in connexion with the modal scales and their only raison  $d'\acute{e}tre$  is to bring all the  $e \acute{\iota} \delta \eta$  within the best range of the voice. Aristoxenos himself clearly indicated this when he commenced the fifth part of his work with the words (p. 37):  $\tau \grave{o} \pi e \rho \grave{\iota} \tau o \grave{v} s \tau \acute{o} \nu o v s \acute{e} \acute{\phi}' \mathring{o} \nu \tau \iota \theta \acute{e} \mu e \nu a \tau \grave{a} \sigma v \sigma \tau \acute{\eta} \mu a \tau a \mu e \lambda \omega \delta e \^{\iota} \tau a \iota$  and Claudius Ptolemaeus several times lays stress on the point. 17

#### VIII.

Did the  $\epsilon l \delta \eta$  have any place in the practical art of music after the time of Aristoxenos, or did they only survive in theory books? The only argument ever brought forward against their use is that the 'species' of the fourth and fifth are also included in theory books and no one supposes that they were practical. The answer to the objection and the confirmation of the view that the  $\epsilon i \delta \eta$  remained practical is to be found in the systematic work of Aristoxenos himself. He says (p. 6): 'Our presentation of the various methods in which simple intervals may be collocated will be followed by a discussion of the resulting scales (including the Perfect Scale) in which we will deduce the number and character of the scales from the intervals, and will exhibit the several magnitudes of scales as well as the different figures  $(\sigma \chi \eta \mu a \tau a)$ , collocations and positions possible in each magnitude; our aim being that no principle of concrete melody, whether magnitude or figure or collocation or position should lack demonstration. This part of our study has been left untouched by all our predecessors with the exception of Eratokles, who attempted a partial enumeration without demonstration . . . . He failed to observe that unless there be a previous demonstration of the figures  $(\sigma \chi \dot{\eta} \mu a \tau a)$  of the Fourth and Fifth, as well as the laws of their melodious collocation, such an empirical process (= as that of Eratokles)

<sup>16</sup> Mr. Torr's theory of the τόνοι was mentioned in Section I. He supposes that Aristoxenos did not use a tempered scale and consequently that the size of the tones differed. Ptolemy (ii. 9) however accuses Aristoxenos of vagueness in the correct determination of intervals and Aristoxenos himself never worries about the distinction between a 'leima' and an 'apotome.' He calls both intervals a semitone. Consequently we must not assume with Mr. Torr that Aristoxenos was not using a scale which was

virtually tempered. Even if the scale were as Mr. Torr asserts, it would be the same for every  $\tau \delta \nu o s$ . It is hard to see how Mr. Torr's minute differences of interval had any basis in theory or in fact, as far as the  $\tau \delta \nu o \iota$  are concerned.

<sup>17</sup> Harmonika, ii. 6: ή δὲ τάσις οὐχ ὡς τάσις ἀλλ' ὡς ἔνεκα τοῦ μέλους. ii. 7: οὐδὲ γοῦν ἔνεκεν τῶν βαρυτέρων ἡ ὀξυτέρων φωνῶν εὔροιμεν ὰν τὴν σύστασιν τῆς κατὰ τὸν τόνον μεταβολῆς γεγενημένην.

will give us not seven figures (of the octave) but many multiples of seven. Aristoxenos was the first scientific writer of Greek musical theory, and he set himself to find some principle whereby he might determine whether a given series of tones and semitones was practical or not. The five tones and two semitones forming an octave might be arranged in all kinds of ways, as:—

### SSTTTTT; or TTTTSST; or TSTTTTS,

none of which have a parallel in the actual scales in use. The method of Aristoxenos was to show first the species of the fourth (T T S; T S T) S T T) and fifth (T T T S; T T S T; T S T T; S T T T) and then to formulate the law of their melodious collocation which is (Arist. p. 65; that no scale should have in succession four intervals of a tone and the species of the two smaller consonances should be combined to avoid such a sequence. The later theorists give the species of the fourth and fifth but do not always point out that they are subsidiary and due to a desire to bring theory into a real close relationship with practice.

We cannot leave this part of our discussion without a short reference to Macran's ingenious theory of a movable Mese. Relying on one of the Aristotelian Problems (xix. 20) which states that the melody returns often to the Mese, he concluded that it was the Mese (or central note) of the Greater Perfect System which was meant. Thus in the typical scale:—

#### A B C D E F G A' B' C' D' E' F' G' A''

the middle A' is the Mese. In the Mixolydian section B-B' the Mese is near the top, in the Dorian section E-E' near the middle, and in the Hypophrygian G-G' near the bottom. Thus a melody in the Mixolydian keeps to the high notes of the scale rather than to the low, and in that sense it is a high-pitched scale. The Hypophrygian, on the contrary, uses its lower notes more frequently and so is a low-pitched scale. Mr. Denniston (Cl. Quart., 1913, p. 90) has already pointed out very serious objections to this theory and there is no need to repeat them here. We may, however, remark that it is by no means certain that by Mese the middle note of the Greater Perfect System was meant. It is very probable that only the Dorian scale is intended, and even if other scales are to be included the 'Mese' may be merely the fourth note ascending in any scale.<sup>18</sup> Still, the rejection or acceptance of Macran's theory does not involve the acceptance or rejection of the modal view of Greek music; it deals only with one particular view of the kind of modality. The evidence is too slender and the objections too weighty to justify an implicit belief in this theory.

1276 B, seems to imply it. It may even have been the older of the two nomenclatures, cf. Weil and Reinach, *Plutarque*, p. 44, n. 107.

<sup>18</sup> Such a view of course involves the use of what is known as the ὀνομασία κατὰ θέσιν, or nomenclature by position and not by function. It does not occur definitely before Claudius Ptolemaeus but Aristotle, *Politics*, iii. 3,

#### IX.

We have now traced a modal structure in Greek music from the times before Plato down at least to a few centuries after the death of Aristoxenos. Up to this point our authorities have been Greek musicians themselves, such as Aristoxenos, or writers compiling from older Greek sources, as Aristides Quintilianus; but for the remainder of the history of modality we shall have little to do with Greek musicians. Evidence for the next stage has to be sought from an Alexandrian writer, Claudius Ptolemaeus, while the final stage is found only in the ecclesiastical writers on music. The reason for this significant fact is not hard to find. The battle of Chaeronea in 338 B.C., while crushing the liberties of the Greek states, did in the long run result in a spreading of Greek culture and learning, and the new city of Alexandria gradually became one of the most wealthy and enlightened cities of the known world. The first two rulers founded the magnificent library there, and their successors, whatever faults they had morally or politically, carried on the work of encouraging the love of letters and learning. The seventh Ptolemy, for example, brought from Greece grammarians, philosophers, geometricians, painters, physicians, and musicians who taught the Alexandrians all they knew. Under the care of such rulers, Alexandria became the rival of Athens itself and an important centre of later Greek culture. Thus Athenaios records the proud boast that the Alexandrians were more skilled in music than all other peoples, especially in the use of kithara and flute.

From this city came the most important musical writer of later antiquity, the mathematician Claudius Ptolemaeus, who brings out very clearly the modal structure of later Greek music.

We have already described the way in which the various two-octave scales, the τόνοι, arose from the necessity of keeping melodies within the best range of the voice. At first the relative pitch of these τόνοι was not rigidly fixed. Aristoxenos (p. 36) says: 'The fifth part of our science deals with the keys in which scales are placed for the purposes of melody. No explanation has yet been given of the manner in which those keys are to be found, or of the principle by which one must be guided in enunciating their number. The account of the keys given by the Harmonists closely resembles the observance of the days, according to which, for example, the tenth day of the month at Corinth is the fifth at Athens and the eighth somewhere else. Just in the same way some of the Harmonists hold that the Hypodorian is the lowest of the keys; that half a tone above it lies the Mixolydian; half a tone higher the Dorian; a tone above the Dorian the Phrygian; likewise a tone above the Phrygian, the Lydian. The number is sometimes increased by the addition of the Hypophrygian clarinet at the bottom of the list. Others again, having regard to the finger holes of the flutes, assume intervals of three quarter-tones between the three lowest keys, the Hypophrygian, the Hypodorian, and the Dorian; a tone between the Dorian and the Phrygian; three quarter-tones again between the Phrygian and the Lydian; and the

same distance between the Lydian and the Mixolydian. But they have not informed us on what principle they have persuaded themselves of this location of the keys.' In practice the difference of a quarter-tone or semitone is not serious, but a theorist desiring to find some system in the usage of musicians must fix the relative pitch of the  $\tau \acute{o}\nu o\iota$ . This we know from later writers was one of the great achievements of Aristoxenos. He himself in his extant writings only mentions six  $\tau \acute{o}\nu o\iota$ , but the result of his labours was to fix at least theoretically a  $\tau \acute{o}\nu o\iota$  on each semitone of the octave, making thirteen  $\tau \acute{o}\nu o\iota$  in all.

Now it is clear that if the only reason for the evolution of the τόνοι was the desire to sing all the modes in the best range of the voice, there is no need for thirteen τόνοι. One τόνος for each mode, making seven in all, would be sufficient. Why Aristoxenos devised a scheme of thirteen it is difficult to say, but possibly he was misled by an excessive desire to systematise the art; for the seven τόνοι system would make the Mixolydian and the Lydian a semitone apart while the Lydian and Phrygian would be a whole tone That may have seemed unmethodical to Aristoxenos and led him to introduce his so-called Aeolian τόνος between the Phrygian and Lydian and in a similar way to put a τόνος on every semitone. At any rate so large a number of keys was unnecessary. The first writer to point this out was Claudius Ptolemaeus, who wrote during the middle of the second century of our era. He himself, to judge by the cold, impartial tone of his work, was summing up the work of many generations of theorists and musicians. A mathematician himself, he had a bias towards the Pythagorean school but he criticises Pythagoras and Philolaos no less than he does Aristoxenos. Possessing a more penetrating mind and a finer judgment than his predecessors he does not leave out of account, as so many theorists do, the practical art of music in his discussions. In spite of his pedantry, his crabbed style and his speculations on the zodiac, his work remains as one of the sanest, most erudite and valuable books on music which we possess.

Ptolemy realised very clearly the real function of a  $\tau \acute{o}\nu o\varsigma$  as being not a mere raising or lowering of pitch but a means of bringing all the modes into one compass. The mere realisation of the function of a  $\tau \acute{o}\nu o\varsigma$  was as Ptolemy saw sufficient to determine the number of  $\tau \acute{o}\nu o\iota$ , but it is characteristic of Ptolemy's thoroughness that he proves his point carefully by an appeal to the actual practice of kithara players. This part of his work is well worthy of a fuller description.

We have seen already that each note of the Greater Perfect System had a name derived originally from the position of the corresponding string on the instrument; but in the course of time the names no longer implied to the theorists the position of a string but the function of a note in its relation to the other notes of the scale. The Mese for example was really the middle string but later it was defined as 'the lower note of the disjunctive tone which lay between the tetrachord Meson and the tetrachord Diezeugmenon.' There is reason however to believe that the players on string instruments continued to call the lowest string the Proslambanomenos,

the highest the Nete and the middle one the Mese. There were thus two ways of naming and regarding a note, one by its functions in a scale  $(\kappa \alpha \tau \lambda \delta \acute{\nu} \nu a \mu \iota \nu)$ , the other by the position of the corresponding string on the lyre or kithara  $(\kappa \alpha \tau \lambda \theta \acute{\epsilon} \sigma \iota \nu)$ . No confusion arose from this duality of nomenclature so long as the kithara was raised or lowered as a whole for each change of  $\tau \acute{o}\nu o s$ ; for then the Mese  $\kappa \alpha \tau \lambda \delta \acute{\nu} \nu a \mu \iota \nu$  would always be coincident with the Mese  $\kappa \alpha \tau \lambda \theta \acute{\epsilon} \sigma \iota \nu$ . But the insistence of Ptolemy on these two different nomenclatures shows that some difficulty did arise in tuning (ii. 5). What was this difficulty?

In earlier days it had been found easier to bring a new  $\epsilon i \delta o s$  into range by means of a  $\tau \acute{o}\nu o s$  than to alter the strings of the mode already in range. That was a matter of practical convenience and, as we have seen, the only reason for the existence of the  $\tau \acute{o}\nu o \iota$ . Long before the time of Ptolemy however the kithara had been so elaborated that it became possible to raise the pitch of any string a semitone mechanically in passing; that is to say, it was now easier to alter the mode within range than to tune up the whole of the kithara. The effect of this process will be seen better by an example. Take the Dorian  $\tau \acute{o}\nu o s$ :—

$$B\flat \quad C \quad D\flat \quad E\flat \quad F \quad G\flat \quad A\flat \quad B\flat' \quad C' \quad D\flat' \quad E\flat' \quad F' \quad G\flat' \quad A\flat' \quad B\flat''$$

where the middle  $B_{p}'$  is both the Mese  $\kappa a\tau \lambda$   $\delta \acute{\nu} \nu a \mu \nu$  and the Mese  $\kappa a\tau \lambda$   $\theta \acute{\epsilon} \sigma \iota \nu$  also, and the section F-F' the Dorian Octave (S T T T S T T). If the player desires the Hypodorian mode he has two methods of obtaining it, the old method and the newer one. By the old method he would tune down the whole kithara to the Hypodorian  $\tau \acute{\nu} \nu \sigma s$  commencing on F and giving the Hypodorian octave-species in both the octaves F-F'. But since the elaboration of the kithara, it was no longer tedious to alter a few strings and the kitharist had at his disposal a very easy method of obtaining the required mode. By raising the  $G_{p}$  in the Dorian  $\tau \acute{\nu} \nu \sigma s$  which he had already he found within the octave F-F' the Hypodorian sequence, T S T T S T T; and the whole scale stood as:—

$$B\mathfrak{b} \quad C \quad D\mathfrak{b} \quad E\mathfrak{b} \quad F \quad G \quad A\mathfrak{b} \quad B\mathfrak{b}' \quad C' \quad D\mathfrak{b}' \quad E\mathfrak{b}' \quad F' \quad G' \quad A\mathfrak{b}' \quad B\mathfrak{b}''$$

The middle Bb here is still the Mese  $\kappa a \tau \lambda$   $\theta \epsilon \sigma \iota \nu$ , but in reference to the Hypodorian  $\tau \delta \nu o s$  it is the 'paramete diezeugmenon  $\kappa a \tau \lambda$   $\delta \nu a \mu \iota \nu$ '; the lower Bb is the proslambanomenos  $\kappa a \tau \lambda$   $\theta \epsilon \sigma \iota \nu$  but the 'lichanos hypaton  $\kappa a \tau \lambda$   $\delta \nu a \mu \iota \nu$ .' In modern terminology, we have here a Hypodorian  $\tau \delta \nu o s$  commencing not on the tonic but on the subdominant. By raising the Db in each octave also we obtain a Phrygian  $\tau \delta \nu o s$  commencing on the 'leading note' or seventh degree of the scale. Similarly by raising the other notes we obtain other  $\tau \delta \nu o \iota$  commencing on a note which is not their real tonic but giving within the octave F-F' a new mode or octave-species.

Ptolemaeus however points out that there are only six notes which we

can raise thus (ii. 11); for when we raise the seventh (C) the Mese  $\kappa \alpha \tau \dot{\alpha}$   $\theta \dot{\epsilon} \sigma \iota \nu$  once more coincides with the Mese  $\kappa \alpha \tau \dot{\alpha}$   $\delta \dot{\nu} \nu \alpha \mu \iota \nu$ , and we have no new mode but only the repetition of a former one a semitone higher. But the object of a new  $\tau \dot{\nu} \nu \sigma s$  is to obtain a new mode; therefore the eighth  $\tau \dot{\nu} \nu \sigma s$  formed by raising the seventh note is useless and seven  $\tau \dot{\nu} \nu \sigma \iota$  are sufficient. These seven essential  $\tau \dot{\nu} \nu \sigma \iota$  are here given with their Proslambanomenoi  $\kappa \alpha \tau \dot{\alpha}$   $\delta \dot{\nu} \nu \alpha \mu \iota \nu$  in ascending order of pitch:—

 $\mathbf{F}$ Hypodorian... Hypophrygian G ... ... Hypolydian... ... A Dorian ... ... BbPhrygian ... ...  $\mathbf{C}$ Lydian ... ... ...  $\mathbf{D}$ Mixolydian ... Eb ...

There is no need to point out at length how decisive the work of Ptolemy is for the contention that modality was the basis of Greek music and the connecting link between that and our own. Ptolemy himself is not an innovator but an energetic scholar who sums up the results of centuries of work. The number of essential  $\tau \acute{o}\nu o\iota$  must have been realised long before him; he was the first to treat the subject fully. One point however must be clearly understood: the  $\tau \acute{o}\nu o\iota$  as they existed in practice in the time of Ptolemy were called  $\tau \acute{o}\nu o\iota$  but actually were modes pure and simple; for the 'scheme' of the kithara was changed with the alteration of every string. Ptolemy himself realised this fact but later mediaeval theorists failed to perceive it, as will be seen shortly.

Χ.

The most vital part of our work is now complete and it should be clear that Greek music was modal down at least to the time of Ptolemy. Few would deny that the modes as we find them in Ptolemy are the basis of the liturgical music of the Church and consequently the ultimate basis of modern music. At the same time it is not an entirely easy matter to thread our way through the theorists of the middle ages and we must be prepared to find there misunderstandings and mistakes which, however interesting they may be, served only to add confusion to an already difficult subject.

The Christian church, whose minor glory it is to have been the musical link between the Greeks and ourselves, had its chief seats in cities which were Greek in culture. We have seen how Alexandria in particular had become one of the greatest centres of Hellenic culture, influencing the whole Mediterranean civilization. Rome too owed a great debt to Greece in music as well as in literature; and whatever the aboriginal music of Italy may have

been, all traces of it were lost by the end of the Punic wars. In the time of Cicero some connoisseurs could recognise the music of Greek choruses after the first few notes had been played. Vitruvius too shows the Aristoxenian theory in vogue in Rome in the time of Augustus. Many of the extant pieces of Greek music date actually from the early Empire and most of the theoretical works were written during that period. As far as music was concerned the Mediterranean civilization as a whole was entirely indebted to Greece.

In this atmosphere of Greek culture the Christian Church grew strong, and it was Greek rather than Hebrew music which became the foundation of the liturgy.<sup>20</sup> The influence of music on the spirit was clearly recognised, and in accordance with the advice of the Apostles sacred songs were freely used.<sup>21</sup> Roman and Corinthian and Alexandrian proselytes were accustomed only to Greek music, and the sacred hymns of the Church would of necessity be based on the kind of music then in vogue. 'Secular and degrading ceremonial forms would naturally have been rejected as unworthy of imitation and models would be looked for in the graver kinds of music, in the hymns to the gods, and the long narrative cantatas of the Graeco-Roman kitharodoi; but it will still remain none the less evident that the music of the Christian ritual, from the nature of the conditions under which it came into being, must for a long time have resembled in its general outlines the music which was going on around it. We should therefore expect to find deeply marked traces at least of the Graeco-Roman practice in the first efforts of the Church. And turning to the oldest Christian compositions, the hymns and antiphons of the Office of which the earliest examples date from the fourth century, we find these expectations amply justified.' 22 By this time the diatonic 'genus' had won its way to absolute supremacy. Even in the time of Plutarch the enharmonic was falling into disuse and Gaudentios in the fourth century tells us definitely that both the enharmonic and chromatic had become obsolete.

Perhaps the most interesting link between the Greek times and our own is found in the Water-organ. This instrument was invented by Ctesibius, an Alexandrian and contemporary of Archimedes (230 B.C.). Its use spread rapidly, and Vitruvius gives us a detailed description of it (*De Arch.* x. 8). It was employed early in the Church, and is mentioned frequently by ecclesiastical writers.<sup>23</sup> The early adoption of this instrument may be regarded as a definite indication that Christian music was none other than

<sup>19</sup> Cic. Acad. Pr. ii. 7. Quam multa, quae nos fugiunt, in cantu exaudiunt in eo genere exercitati! qui primo inflatu tibicinis Antiopam esse aiunt aut Andromacham cum id nos ne suspiciemur quidem.

<sup>&</sup>lt;sup>20</sup> D. G. Morin (Les Véritables Origènes du Chant Grégorien, 1904) would have us believe that the ornamental melodies were Hebrew and anterior to the syllabic music (cf. Gevaert, La Melopée Antique dans le Chant de l'Eglise).

<sup>&</sup>lt;sup>21</sup> Cf. Eusebius, *Hist. Eccles.* v. 28. 5; Augustine, *Confess.* ix. 7; John Cotton, c ap x.; Pambo, *Gerontikon* (Gerbertus, i.).

<sup>&</sup>lt;sup>22</sup> Wooldridge, Oxford History of Music, vol. i. p. 25.

<sup>&</sup>lt;sup>23</sup> Tertullian, De Anim. 14; Cassiodorus, Expositio in Psal. cl.; Isidorus, Etymol. iii. 21. cf. Rev. des Et. Gr. 1896, p. 23; Philologus, 1906, lxv.

the contemporary Greek music; for, unlike the string instruments, it could not be retuned once it was made.

The first important name we meet in connexion with Christian music is that of St. Ambrose, Bishop of Milan about the year 360 A.D. Until quite recent times there was a tradition firmly believed that he took from the Greeks four modes and made them the basis of liturgical music. Such a view is no longer held, but it is undisputed that St. Ambrose did introduce into Europe what is known as antiphonal singing. This style came actually from the Greek city of Antioch, and after the experiment of St. Ambrose, Pope Celestin (422–432) authorised its use throughout the Church.<sup>24</sup> St. Augustine in his Confessions describes the warming effect of this change on the minds of listeners. But no old writer is found to attribute definitely to St. Ambrose the introduction of Greek modes into the music of the liturgy. By the natural sequence of events they had been there from the beginning.

It has already been hinted that the mediaeval theorists are confusing and the source of the confusion is to be found in the work of a non-Christian writer, Boethius. For Latin readers he transcribed as best he could the elements of the arts and sciences of Greece, geometry, arithmetic and music. In music he seems to have taken for his basis the work of Ptolemaeus; but he transcribed Ptolemy so badly that Gevaert doubts whether he knew the Alexandrian work at first hand. Chapters 13 to 17 of the fourth book of his Institutio Musica contain the gist of the trouble. He commences by giving the seven species of the octave, first by numbers and references to a diagram, secondly by names. We find that whereas Kleonides and other writers give the Mixolydian as the first species and the Hypodorian as the seventh, Boethius has reversed the order. That may of course be a purely arbitrary arrangement but it is very suspicious when we remember that the order of the octave-species is just the reverse of that of the keys  $(\tau \acute{o}\nu o)$ (cf. Sect. VII.). Has Boethius mixed them up? A glance at chapters 15 and 16 at once convinces us that he has; for his language is vague and the table he gives with a curiously garbled Greek notation for the seven 'modes' is actually a list of the seven τόνοι of Ptolemy each extending to two octaves. Furthermore he adds a Hypermixolydian 'mode' marking it as the highest and the Hypodorian as the lowest. This eighth 'mode' (he acknowledges it to be 'incongruum') is explained by saying that Ptolemy added it. As a matter of fact Ptolemy devoted a whole chapter to proving that there were only seven octave-species and therefore only seven τόνοι (ii. 9). What has happened? It has already been pointed out that the τόνοι given by Ptolemy are really modes even though they retain the old name of τόνοι. Boethius seems partly to have realised this fact but failed to see in what way exactly the τόνοι of Ptolemy came to be modes. Consequently his list of 'modes' is really a list of the τόνοι and as a further result, we find them in

<sup>&</sup>lt;sup>24</sup> Theodoretus, ap. Cassiodorus, Hist. Eccles. Tripart, v. 33; Isidorus, Eccles. Offic. i. 7. 8. Liber Pontificalis, vol. i. 230.

the reverse pitch order of the 'octave-species' of older theorists. The three lists in ascending order of pitch are:—

Octave-Species	τόνοι of Ptolemy	"Modes" of Boethius
Mixolydian	Hypodorian	Hypodorian
Lydian	Hypophrygian	Hypophrygian
Phrygian	Hypolydian	Hypolydian
Dorian	Dorian	Dorian
Hypolydian	Phrygian	Phrygian
Hypophrygian	Lydian	Lydian
Hypodorian	Mixolydian	Mixolydian
v 1		Hypermixolydian

A further example of the growing confusion in nomenclature (and consequently in theory) is found in an interesting letter which Cassiodorus, the first Christian writer on music, sent about the year 508 A.D. in the name of the great Theodoric, charging his friend Boethius to choose for the French king Clovis a talented kithara player. In this letter we have mention of five 'toni' with their names and a description of the effects they had upon the emotions of men; and it seems that Cassiodorus is really referring to the modes and not to the keys. As we shall have occasion to remark, later theorists argued at length about the proper word to use, 'modus' or 'tonus.'

Already in the *Institutiones Musicae* of Cassiodorus much of the Church liturgy seems to be fixed; but the only theory which is given is a garbled version of the old Greek one. These early writers seem to have looked definitely to the Greeks as their musical ancestors, but in the actual composition of melodies they modelled their work on concrete examples rather than according to a rigid theory. Violent changes of principle or farreaching innovations of course played no part in the musical history of this period. The art of composition was conducted along well-worn channels even though the theory was growing dim and confused. After the political events of the last half of the sixth century all real knowledge of the old theory died away and St. Isidore early in the next century can scarcely understand Boethius or Cassiodorus.

From this point until the ninth century we find no musical treatise of any kind though the composition of melodies continued steadily. The silence is broken about 850 A.D. by a certain Aurelian in his Musica Disciplina, where a new theory makes its appearance. After a poor account of the old Greek theory he mentions eight 'toni,' four authentic and four plagal. So far as we can judge, during the centuries intervening between Cassiodorus and Aurelian the churches of Asia Minor had evolved for their own convenience a new theory. It was seen that the vast majority of melodies ended on one of four notes. Some melodies never went below these 'Finals,' others went as much as a fourth below. The melodies which did not go below the Final were called authentic, the others plagal. Thus on to the old music a new theory was grafted.

The next and most interesting stage is the grafting of the mistaken theory of Boethius on to the new theory of the modes. Notkerus, a Spanish writer of the tenth century, gives the first indication of it; for in his treatise he gives the eight modes (he does not make up his mind whether they are 'modi' or 'toni') in ascending order as: Hypodorian, Hypophrygian, Hypolydian, Dorian, Phrygian, Lydian, Mixolydian, Hypermixolydian, which are just the modes of Boethius. Thus the lowest of the ecclesiastical modes is equated with the lowest of the pseudo-modes of Boethius.

In the same century, Guido stands alone in refusing to bow down to Boethius whose book is 'of no use to musicians but only to philosophers.' By the end of the eleventh century however the matter has been definitely settled. The modes are now called 'toni' and John Cotton (chap. x.) gives them fully as:—

1. Protus Authentus	 	Dorian	 (D-D)	Final	D
2. Protus Plagalis	 	Hypodorian	 (A-A)	,,	$\mathbf{D}$
3. Deuterus Authentus	 	Phrygian	 (E-E)	,,	$\mathbf{E}$
4. Deuterus Plagalis	 	Hypophrygian	 (B-B)	,,	$\mathbf{E}$
5. Tritus Authentus	 • • •	Lydian	 (F-F)	,,	$\mathbf{F}$
6. Tritus Plagalis				,,	$\mathbf{F}$
7. Tetradus Authentus	 	Mixolydian	 (G-G)	,,	$\mathbf{G}$
8. Tetradus Plagalis	 	Hypomixolydian	 (D-D)	,,	$\mathbf{G}$

It is noteworthy that the Hypermixolydian is now called the Hypomixolydian and can in no sense be said to be the highest mode (supremus) as Notkerus stated.

In this state the ecclesiastical modes have remained until the present day in the liturgy of the church. The manner in which modern music was gradually developed from them can be found in any work on musical history and need not concern us here. But before leaving the subject however our results may be seen to advantage in tabular form.

(1) The  $\epsilon i\delta \eta$  or octave-species are in the reverse order of pitch to the seven  $\tau \delta \nu o \iota$  of Ptolemy:—

The $\epsilon$ ion as	cending	ng	The	τόν <b>ο</b> ι	of Pte	olemy ascending		
Mixolydian		(B-B)	Hypodoria	ın		commences	on	$\mathbf{F}$
Lydian			Hypophry	gian		,,	,,	$\mathbf{G}$
Phrygian			Hypolydia			,,	,,	$\mathbf{A}$
Dorian			Dorian	· · •		,,	,,	ВЪ
Hypolydian			Phrygian			· • • • • • • • • • • • • • • • • • • •	,,	$\mathbf{C}$
Hypophrygian		(G-G)	Lydian		• • •	"	,,	$\mathbf{D}$
${ m Hypodorian}$	• • •	(A-A)	Mixolydian			,,	,,	Еþ

(2) Boethius vaguely transcribed the τόνοι of Ptolemy as modes; the ecclesiastical writers gave to the lowest of their 'modes' or 'tones' the name of the lowest of the pseudo-modes of Boethius thus:—

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Scales of Boethius ascending	9	Liturgical Ton	es ascen	ding
Hypodorian	$\mathbf{F}$	Hypodorian		(A-A)
Hypophrygian	G	Hypophrygian		(B-B)
Hypolydian	A	Hypolydian		(C-C)
Dorian	Вþ	Dorian		(D-D)
Phrygian	$\mathbf{C}$	Phrygian		(E-E)
Lydian	D	Lydian		(F-F)
Mixolydian	Εþ	Mixolydian		(G-G)
Hypermixolydian	?	Hypomixolydian	ı	(D-D)

(3) The Greek octave-species do not as a consequence correspond with the liturgical modes of the same name:—

		,	Greek είδη	Liturgical Tones
Mixolydian		 	В-В	G-G
Lydian		 	C-C	$\mathbf{F}$ $\mathbf{-F}$
Phrygian		 	D-D	E-E
Dorian		 	E-E	D-D
Hypolydian		 	F-F	C-C
Hypophrygian		 	G-G	В-В
Hypodorian		 	A-A	$\mathbf{A}\mathbf{-A}$
Hypomixolydia	ın	 		(D <b>–</b> D)

What then are the general results of our investigations? Greek music was modal in structure before the time of Plato in the form of the ἀρμονίαι; it continued so in post-Aristoxenian times in the form of the εἴδη τοῦ διὰ πασῶν; and remained so at least as far as the time of Claudius Ptolemaeus. This modal music became the foundation of the church liturgy and though the underlying theory became obscured during the middle ages, the music itself remained essentially modal. Thus the connexion is not as difficult to trace as some authorities believe or as well defined as others have assumed. While on the one hand it is not a fully documented and demonstrable fact it is on the other hand far more than a hazardous conjecture. As far as we are likely to know, it is, in the main outlines at least, certain and real; and we may without exaggeration regard modern music as the lineal descendant of Greek.

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## GREEK MUSIC FROM THE MODERN POINT OF VIEW "

THE few minutes allotted to me urge the utmost brevity in stating a few facts concerning an obscure subject, with which, perhaps, only a small portion of this audience is thoroughly acquainted. It is impossible, in so short a time, to treat scientifically a topic not generally understood. I must omit numerous quotations from the technical writers collected by Meibom, Wallis, Bellermann, von Ian, and others; I must also refrain from proving and corroborating my statements by other loci de musica from the works of Plato, Aristotle, Plutarch, Athenæus, Philodemus, Pollux, Iamblichus, Theo Smyrnæus, Boëthius, Vitruvius, Martianus Capella, and many others, references indispensable to a thorough treatment of the subject. In the case of the Greek music the sounds of the voice and of instruments, vanishing with the breath and the vibration of the strings, have been, for the most part. communicated to posterity only in descriptions of their wondrous effect; only in a few instances have they been preserved by means of musical notation. We may, perhaps, assume that this notation was usually added to lyric poems, but neglected by copyists who failed to comprehend its importance. Did it not happen recently that the musical notation of the Seikilos Epigrammation remained unobserved for eight years, after the stone had been found and its inscription published? Statements about music are by no means scarce, but we lack illustrative compositions.

Numerous indeed are the passages in Greek literature, extolling great musicians and their works, and attaching immortality to their names. Numerous are the passages mentioning or describing the favorite instruments and the impression of their sounds upon the human mind and even upon character, and the passages depicting musical exploits, with an enthusiasm in which the vanished beauty of the sounds themselves seems to reecho. Indeed, if we consider the beauty of the poetry of the Greeks, the nobility of their sculpture, the majesty of their architecture, are we not entitled to assume that Greek music also was in harmony with the other arts and was similarly great in its simplicity, in spite of its childhood, and in spite of the primitiveness of the musical instruments?

<sup>&</sup>lt;sup>1</sup> Paper read at the Classical Conference at Ann Arbor, April 1; see p. 479.

The Greek and Roman writers upon music are unfortunately deficient in illustrative examples. Only the Anonymus II of Bellermann contains a few fragments of exercises for the clarinet examples added to the text.

From a late period, the time of Hadrian, three hymns have been handed down; a hymn to the muse Calliope, by the younger Dionysius of Halicarnassus, one to Helios, probably by the same author, and a hymn to Nemesis by a certain Mesomedes. Furthermore we possess a papyrus fragment with the lines 338–344 of the first Stasimon of the Orestes of Euripides. These are the only manuscripts containing musical notes written above the syllables of the text.

Of much greater importance on account of their indisputable genuineness are the fourteen fragments of three hymns to Apollo, inscriptions discovered by the French excavators at Delphi in 1893. These hymns were composed about 280 B. C., after the repulse of the Gauls from Delphi; the first hymn seems especially fit to represent a masterpiece of the musical art during the Alexandrian period.

Finally, a short *nenia*, dedicated by Seikilos to the memory of his wife, was discovered in 1883, near Tralles (in Asia Minor), and proved to contain a few bars of music.

From this scanty material and from the transcription of the Greek notation into modern notation, and the changing of the rhythms into notes of different length (which has been executed with a certain degree of probable correctness), we derive our opinion in regard to post-classical Greek music of the hymnic style. But as yet no trace has been discovered of the *melos* with which the warriors, kindled by a Tyrtæos, strode to battle, no trace of the *melos* of the Encomia, Skolia, Threnoi, the Pæans, of the ancient sacred nomoi—no trace of the melody worthy to follow the words of the choruses of Æschylus; no genuine trace of the melody of a Pindaric ode.

I hasten to enumerate a few points in which ancient Greek music differs essentially from our modern music.

The first difference, a difference in favor of Greek music, consists in the great number of modes, or systems, of scales, formed by the various arrangements of the tones and semitones; we have retained, for our daily use, so to speak, only two, the major and the minor modes. The Greeks possessed about twelve different modes and employed practically at least seven, according to the character of the poem or of the instrumental composition. Some of them have been preserved, with a peculiar shifting of their names, in the so-called church modes.

These Greek modes were formed by establishing a scale from c to c, another from d to d, one from e to e (without accidentals), etc. Like our major and minor, also, the Greek Dorian, Phrygian, Lydian, Mixolydian modes, etc., could be built upon any tone, in any pitch; thus at least  $7 \times 12$ , that is 84 scales resulted, by multiplying the  $\delta \rho \mu o \nu \hat{\omega} \omega$  or  $\tau \rho \hat{\sigma} \sigma \omega$  or  $\epsilon \delta \eta \tau \hat{\omega} \nu \delta \omega \pi \sigma \sigma \hat{\omega} \nu$  by the  $\tau \hat{\sigma} \nu \omega$  or scales of transposition, bearing similar names.

Those acquainted somewhat with folklore and the literature of modern music will remember, that several of these modes have survived in songs of the Scandinavians, of the Slavonians, of the inhabitants of Bretagne and Normandy, and of the Orientals; and finally in the ritual of the Greek church. Such modes are also employed by Beethoven in the A minor Quartet (Op. 132) in the adagio-movement entitled, "Canzona di ringraziamento offerta alla Divinità da un guarrito;" by Berlioz in his first edition of "The Trojans," where the choruses, vying in the praise of Queen Dido, sing successively in the different Greek modes; by Haendel (in his Israel in Egypt chorus No. 11 and No. 27); by Saint Saëns (in the cantata "les noces de Promethée"); by Ambroise Thomas (in the fifth act of "Hamlet," La nuit succède au jour, c'est la loi de ce monde); by Raff (Frühlingsboten No. 3); by Gounod and Berlioz (in the Romance of the King of Thule); by R. Wagner in his music dramas, e. g., the Meistersinger (Das Blumenkränzlein von Seidenfein, at the beginning of third act in Tristan, the shepherd's mournful melody), etc. The completion of this list the philologist must leave to the professional musician.

Another difference between ancient Greek and modern music lies in two of the three genera; one scale, consisting of tones and semitones, was called the diatonic, corresponding with that which we designate by the same term in modern music. It was different with the Greek chromatic genus and the enharmonic genus. To describe these I must remind you of the Greek scale consisting of two tetrachords joined either by one common tone, or disconnected, with an interval of a tone between them. Each tetrachord contained two fixed, and, between these, two movable tones, the interval between the fixed tones amounting to two and one-half tones. The diatonic system employs two and one-half tones; for example, e f g a | b c d e. In the Greek chromatic, a half tone is followed by another half tone, and this group (the  $\pi \nu \kappa \nu \nu \nu$ ) is separated from the next tone by an interval of one and one-half, for example:

In the enharmonic the half tone is divided into two parts; the group becomes still more compact and its dist nce from the fourth tone of the tetrachord still larger; here we have to deal with the interval of about a fourth of a tone, the so-called dieses, thus,

$$\begin{array}{c|c}
e & \overline{b} \\
e & \overline{b} \\
\hline
e & \overline{b} \\$$

Chromatic elements can be found frequently in modern compositions, especially in Chopin and Wagner, although the system scarcely ever has been employed throughout; it is, however, noteworthy that Frescobaldi (in his Fiori musicali, 1635) treats a chromatic fugue constructed upon the tones e f #f a b b nat. The enharmonic system has disappeared in later compositions; it was considered by ancient musical authorities as the finest, noblest and most difficult system, but seems to have flourished during a comparatively short period.

Furthermore, the Greeks employed several chroai, "shadings," nuances, in the diatonic and chromatic system; in the diatonic, the malakon; in the chromatic, the hemiolion and the malakon. In these again the quarter tones, the dieseis, occur. Thus the modes in different pitch, with the three genera and several "shadings" produce a variety of scales, difficult to conceive and undoubtedly almost incomprehensible to the modern ear. The Greek melos was thus enabled to move by steps unfamiliar to the modern composer, unknown to the modern audience.

The much disputed question whether the ancient Greeks were acquainted with harmony and employed it (harmony, that is, the simultaneous sounding of different tones forming chords), has, after vehement discussion during three centuries, been answered thus: Men, women, and children sang in unison, or in octaves; the instrumental accompaniment followed in the earliest time the melody, in later periods the instruments must have produced an accompaniment in different tones (Krusis) of a primitive character; and in this accompaniment we may search after the rudiments of harmony. The question as to how far the ancients considered the interval of the third a consonance cannot be discussed here. The accompaniment was placed higher than the voice, undoubtedly in the case of the flute, probably in the case of the lyre.

The fact that the accompaniment was not forced to follow the melody in tones of equal duration, may be considered as a direct assertion of the existence of polyphony. Polyphony must have been employed also when two or more instruments, were played together; and since Ptolemaeus rejected the monochord as a practical musical instrument for the reason that it could be played with one hand only, we are entitled to the opinion, that on harps, lyres, and similar string instruments, chords were produced. But polyphony of the voices of singers is nowhere mentioned. The solemn but thin Greek music, lacked that most powerful element, harmony, by which modern composers try but too frequently to replace, or to cover the sterility of their imagination in inventing melodies.

The Greeks not only enjoyed a rich variety of scales; they employed also a well-known, but rarely felt, variety of rhythms. Their melodies were strictly bound to follow the flow of the rhythm of the verses, to follow the ἀναξιφόρμιγγες ὅμνοι, probably also the emphasis of certain words and passages, and even the accents of the syllables of a word. Since in lyric poems, and especially in the chorus of the drama, the rhythms frequently changed, the time in a Greek musical composition was accordingly often changed—a rather rare occurrence in modern music; yet many chorales of the sixteenth and seventeenth centuries, passages in Clementis, 7th and 8th sonatas, and in Wagner's dramas show similar alteration, as for instance, a passage in ½ time interrupted by a few bars in ½ time. Some rhythms, as the Cretic, Zacchic, and Dochmiac, are foreign to modern music, yet such occur also in the works of Wagner, Chopin, Tschaikowsky, Rimsky-Korsakow, Berlioz, and others.

At the celebration of a festival, at the performance of a drama with music, we should miss our modern orchestra, that wonderful palette of tone-colors, composed of the string quintette (the Greeks had no violins), of the several kinds of trumpets and horns (trumpets were used by the Greeks only in battle), of the wood-winds (the oboe, clarinet and piccolo alone seem to have been found among the Greeks), and of the instruments of percussion.

The multitude of our musical instruments was reduced to a few kinds of harps with surprisingly short strings, and to the clarinets, or oboe, known as auloi. These primitive instruments accompanied with great simplicity the unison songs, the standard songs of the chorus or soloist, the nomi, or sounded alone in the "psile kitharisis" and "psile aulesis."

We should miss also the queen of our musical instruments, the organ; for the hydraulic organ described by Vitruvius, Athenæus and others of course cannot be compared with it; some would miss the hammer tones of that modern music-machine which, as I hope, will become with future generations, the object of pity or mockery, the piano.

But lovers of the modern symphonic poem probably would find some satisfaction, provided that they could content themselves with the sounds of a flute; they would find the prototype of the symphonic poem in the Pythian nomos of Olympus. With the analysis given by Pollux and with a certain amount of phantasy, which enthusiasts rarely lack, they could decipher from the tones of the five movements of that celebrated nomos, how Apollo appears, surveys the battlefield, challenges the monster Pytho, and, as we may expect in this and similar cases with great certainty, slays the dragon; the disciple of the Liszt-Wagner-Berlioz school could even enjoy the gnashing of the teeth, τὸν ὁδοντισμὸν ὡς τοῦ δράκοντος ἐν τῷ τοξεύεσθαι συμπρίοντος τοὺς ὁδόντας.

And finally he might participate in the triumph of the victorious god.

CHARLES WILLIAM SEIDENADEL

THE UNIVERSITY OF CHICAGO



Greek Theory of Melody Author(s): Richard S. Hill

Source: Bulletin of the American Musicological Society, No. 2, (Jun., 1937), pp. 18-20 Published by: University of California Press on behalf of the American Musicological Society brilliancy of Schubert's and Schumann's. I purposely made them simpler. . . . Although I can see no imperfection in that kind of restraint, it may be the chief reason for the slower dissemination of my work."

Speaking of his songs Op. 12 No. 6 and Op. 25 Nos. 3 and 5, he says: "Heaven knows how it happened that they are strikingly similar to Schumann's compositions; it must have been the fault of the text itself: Schumann's love of poetry was still calmly sleeping when, as I can prove, my master-pieces were already in manuscript."

Speaking further, he says: "I should like to allow myself also a passing remark concerning the conclusion of your essay on myself. Since I was twenty years old I have felt myself especially attracted to two men (not counting musical favorites). Heine was my favorite poet and among prosaic folk my favorite was Charles Seafield. I have never laid aside a work of either without feeling stimulated and to this very day they give me comfort and peace in happy and unhappy hours. I very much wish therefore to pay Heine a small tribute of thanks and I should be only too glad if the world could consider the music to which I have set his songs as the crowning point of my weak endeavors."

# Mediaeval Byzantine Music H. J. W. Tillyard (AMS) (MAY 16TH, 1936)

Note: This paper, delivered at the meeting by Gomer Jones, appears in full in *The Musical Quarterly* for April, 1937, XXIII, 2, pp. 201-209.

Greek Theory of Melody

Richard S. Hill (WNY)

(October 8th, 1936, Aurora, N. Y.)

SINCE MODERN COMMENTATORS on the ancient Greek texts have chiefly concentrated on the vexed question of Greek modes, the general comprehensiveness of the Greek's theory of melody has been forced into the background. The present paper is an attempt to reformulate that theory by fitting together pertinent statements extracted from random passages of Plato and Aristotle, and from the extant texts of Aristoxenus, Aristides Quintilianus, the Pseudo-Aristotelian *Problems*, and the seven additional writers included in Karl Jan's *Musici Scriptores Graeci*. Since these writers are spread over a period of a thousand years, from 400 B. C. to 600 A. D., the changes which undoubtedly took place in the music itself during these years must be allowed for,

and an attempt made to interpret contradictions on the basis of this historical development.

After a few examples of the Greek's conception of sound, both from the physical (i.e., sound resulting from the fusion of a succession of rapid impulses) and psychological (i.e., their recognition that their terms for high and low pitches, ὀξύς and βαρύς, were borrowed only on analogy from other sensory fields) points of view, the main body of the paper started with Aristoxenus' provisional definition of melody: "It is plain that the apprehension of a melody consists in noting with both ear and intellect every distinction as it arises in the successive sounds—successive, for melody, like all branches of music, consists in a successive production. For the apprehension of music depends on these two faculties, sense-perception and memory; for we must perceive the sound that is present, and remember that which is past" (taken from Macran's translation of Aristoxenus' Harmonics). Next, a discussion of his use of the term "intellect" led to the development of the Aristoxenean phenomenology of melody. This was found to bear close resemblance to the functional conception of music as reintroduced into music theory in modern times by Riemann, Schenker, and Erpf. First, Aristoxenus makes it perfectly clear that melody proceeds by jumping discrete intervals, as opposed to speech, where the voice moves continuously with respect to pitch. The points in melody where the voice holds a fixed pitch are defined as notes, and it soon becomes obvious that these notes are organized into a psychologically perceptible system of tones in which each note has its own particular function. As a result of this, the Lichanos may be moved down two whole tones below the Mese (as it is in the Enharmonic genus), and yet the interval between them remains "simple", since no note can be introduced between the Lichanos and the Mese. When he follows this up by the statement that when the ditone is bounded by the Mese and the Parhypate in the Diatonic genus it is a compound interval (since the Lichanos would then fall halfway between them), it becomes certain that for Aristoxenus at least the function of the notes in a system was a completely real and fundamental concept. A number of other passages were quoted to substantiate this interpretation.

This phenomenological formulation of melody was followed by a discussion of the various "parts" of music into which the Greeks analysed the total concept. First, Aristides' table was given. This divides music into the "theoretical" and the "practical", with further parallel subdivisions. The "Theoretical" branch is next divided into "Physical" and "Technical" divisions, the first of these consisting of "Arithmatic" and "Physics", and the second, the "Technical", into

the sciences of "harmonic", "rhythmic", and "metric". Various quotations were given to show that for the Greeks these last three sciences covered the complete theory of lyric poetry (words and music), whereas the science of harmonic included the melodic aspects of this. It is for this reason that we find Tinctoris writing in 1475(?): "Melodia idem est quod armonia." This is further demonstrated by the fact that most of the Greek theorists devote their space to a discussion of the "seven parts of harmonic", namely: note  $(\varphi \vartheta \acute{o} \gamma \gamma o \varsigma)$ , interval  $(\delta \iota \acute{a} \sigma \tau \eta \mu \alpha)$ , system  $(\sigma \acute{v} \sigma \tau \eta \mu \alpha)$ , genera, modes  $(\tau \acute{o} \nu o \iota)$ , modulation  $(\mu \epsilon \tau \alpha \beta o \lambda \grave{\eta})$ , and melody-making  $(\mu \epsilon \lambda o \tau o \iota \acute{\alpha})$ . For most of these terms, Greek definitions were given and the questions discussed.

Thus it may be seen that the Greeks not only had a clear phenomenological conception of melody, but were also able to classify its component parts.

# A Fresh Look at Guido on Polyphony

Leonard Ellinwood (AMS)
(October 11th, 1936)

Our knowledge of the writings of Guido, in spite of a considerable literature, all traces back directly to the faulty edition by Gerbert (Scriptores). Consequently the purchase this summer by the Sibley Musical Library of a 12th-century codex which contained the Guidonian writings was of the utmost interest. Collation of this brief portion of the MS shows many discrepancies, both large and small, in spite of the fact that Gerbert had access to it. The writer was finally able to find a text which accurately described the musical examples, and whose examples themselves were consistent. The result was far removed from the Gerbert edition in several particulars.

Each member of the chapter was given a copy of the musical examples from the *Micrologus* in their corrected form. At the end several examples of *organum* were shown which had been worked out from excerpts of the *Liber Usualis* in application of the rules as expounded by Guido.

The new codex, now known as the Admont-Rochester MS, was purchased from the Admont monastery in Austria, under whose name it has been known to musical scholarship. In addition to the Guidonian writings it contains excerpts from Berno, the *Dialogue* of Oddo of Cluny, the *Musica* of Aribo Scolasticus.



Greek Musical Notation Author(s): Ernest Bergholt

Source: The Musical Times and Singing Class Circular, Vol. 35, No. 620, (Oct. 1, 1894), pp. 696-

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Published by: Musical Times Publications Ltd.

GEORGE H. DREAPER, junior member of the firm of W. H. and George H. Dreaper, pianoforte manufacturers, Liverpool. He died on August 24, at his residence, Westbourne Road, West Kirby, aged fifty-five.

Professor Hermann Ludwig Ferdinand von Helm-

HOLTZ, the great German scientist and author of "The Sensations of Tone as a Physiological Basis for the Theory of Music." He died at Charlottenburg, near Berlin, on the 8th ult. We refer to him more fully in another

MARINO MANCINELLI, for many years conductor of the opera houses at Florence, and afterward at Lisbon, and one of the most notable of Italian operatic directors. He was shorn at Orvieto in 1842 and was a pupil of Mabelini. A short time ago he emigrated to Brazil and became *impresario* and conductor of the opera at Rio de Janeiro, in which town he committed suicide in a fit of temporary insanity. He wrote a large number of songs and an opera, "I Ribelli," which was produced at Lisbon in 1888. He was the elder brother of Signor Luigi Mancinelli, the wellknown conductor of the Covent Garden Opera.

FRAU GABRIELE FRANKL-JOËL, formerly a celebrated pianist and teacher. She was a pupil of Hellmesberger, Brahms, and Goldmark, and, at the period of her death, was pianist to the Imperial Court of Austria. She died at

Hietzing, near Vienna, on August 27, aged forty-one.

Oskar Eichelberg, director of a Conservatione of Music named after him, and a royal Kammermusiker; at Berlin, on August 30, aged forty. He was the composer of a two-act ballet, "Nurjahd," which was produced at

the Berlin Royal Opera in the early eighties.

EMANUEL CHABRIER, one of the most original and eminent French composers of the day, at Paris, on the 13th ult. He was born at Ambert, in January, 1841; studied law in Paris, and remained for sixteen years a clerk at the Ministry of the Interior. During his leisure he studied music and began composing. In 1881 he was appointed leader of the choir at the concerts given by M. Charles Lamoureux and assistant-conductor in which letter Lamoureux, and assistant-conductor, in which latter capacity he did a great deal in making the more advanced works of Wagner—such as "Tristan"—known in Paris. An operetta from his pen, "L'Etoile," had been given at the Bouffes Parisiens in 1877; but the work which made his name known was a grand opera, "Gwendoline"; this was first performed at Brussels in 1886, in 1889 it was played with great success at Carlerube, under Falix Mottl played with great success at Carlsruhe, under Felix Mottl, and in 1890 at Munich, under Hermann Levi. It was not till January 4 last that this striking work, one of the most difficult and most beautifully orchestrated in the whole range of modern opera, was performed at the Paris Grand Opera. The unfortunate composer was then already struck with partial paralysis of the brain, and at the rehearsals he seemed unconscious of the fact that the music which he heard was his own. One of his most popular works is the Orchestral Rhapsody on Spanish Airs, entitled "España, a brilliantly-scored and altogether fascinating work, which was exceptionally successful. His "Roi malgré lui" was produced at the Opéra Comique in 1887. A second unfinished grand opera, "Briséis," as well as several other works, are in manuscript. Chabrier is another addition to the list of French composers who found more honour in foreign countries than in France.

FRAU TONI KOHN-SPEYER, a daughter of the well-known composer of dance music, Labitzky, As Fräulein Labitzky she belonged for fifteen years to the Frankfort-on-Main

opera. She died recently at Königstein.
GUSTAVE FREDERIX, for thirty-five years dramatic and musical critic of the *Indépendance Belge*, and a member of the Académie Royale de Belgique. His smartly written critiques were distinguished by sound taste and a refined style, and he was generally esteemed one of the best critics in Belgium. He died at Brussels on August 25, aged

CESARO GALLIERA, composer of a successful opera, "Zagranella," and another, entitled "La Dama bianca d'Avenello." In later years he resided at Munich, where he was much esteemed as a teacher of singing; the famous Wagner singer, Herr Vogl, being one of his pupils. He

died at Salo, Italy, aged sixty.
Pio Ferrari, a professor of harmony and counterpoint at the Royal Institute at Parma. He died at Fabiano.

Magnus Peterson, organist and choirmaster of St.

John's Church, Wellington, died suddenly on June 30.
Mrs. Lyne-Stephens, who, fifty years ago, under the name of Louise Duvernay, was considered one of the finest operatic dancers. We refer to her at length in another column.

LEON MAYEUR, for many years first clarinet in the orchestra of the Paris Grand Opéra, to which post he was appointed on the strong recommendation of Meyerbeer. In 1870 he became sub-conductor of the Garde Républicaine and founder of the Concerts at the Jardin d'Acclimation. He was also known as a skilful player on the saxophone. He did much to improve this instrument and composed and arranged a great deal of music, including a "Method," for it. He died recently at Cannes, aged fifty-two.

## CORRESPONDENCE.

#### GREEK MUSICAL NOTATION.

TO THE EDITOR OF "THE MUSICAL TIMES."

SIR,—Mr. Torr informs me in your last issue that his theory of the Greek notation is not that of M. Vincent. Mr. Torr may reasonably be supposed to know what his own theory is; but is he familiar with that of M. Vincent? I incline to think, from the manner in which he repudiates it, that he is not, and that he has been misled by the term "Pythagorean diesis," which M. Vincent somewhat oddly adopted. The more Mr. Torr develops his views, the more they seem to me to be an exact replica of M. Vincent's; but I need not take up your space with a demonstration of this, as the point is of subordinate im-

I also learn from Mr. Torr's last letter that I was wrong in assuming that he holds the Greek notes to represent fixed pitches. I apologise, and withdraw my letter of July 30 directed to this point. In palliation of my obtuseness, however, I trust I may be allowed to mention that many others understood Mr. Torr just as I did.

I deny altogether that Aristides and Gaudentius are describing music different from that catalogued by Mr. Torr's grand authority Alypius. Mr. Torr's own date for Aristides (THE MUSICAL TIMES, p. 555, col. 2) is "about 500 years after Aristoxenus." Of the date of Gaudeus nothing is known. But he ignores Ptolemy's work on music and has been supposed thesefore to be a supposed thesefore to be a supposed thesefore to be a supposed to be a s music, and has been supposed, therefore, to have written earlier than that writer. The latest authorities, however, place him about 390 A.D. Now the date of Alypius is A.D. 360, or later.\* Gaudentius explicitly says that the ancients used the "homotones," and that the latter were also employed, at successive intervals, to express the "pycna." Nothing whatever is said by either author as to a reduction of the notes of the octave from twenty-one to twelve; and that they had no such reduction in view when writing the passages quoted is sufficiently obvious from their mention of the enharmonic genus in the same breath.

Furthermore, as Professor Bellermann has shown ("Die Tonleitern . . . der Griechen." Berlin, 1847, pp. 69-77), there did actually exist in the original MSS. of Aristides a complete list of the fifteen keys, in the three genera, his "reduced" scales being merely intended as an elucidation

of the fundamental forty-five as exhibited by Alypius.

Of two notes such as K and A, says Mr. Torr, Aristides took in all cases the first, whereas Gaudentius seems to have taken the second. This is also an error. From pages 25 to 28 of Aristides there are four lists of the notes. In the second and third lists every note is set forth (allowing the second and third lists every note is set forth (allowing for the  $lacun\alpha$  of copyists); the order of the second list being strictly alphabetical. The fourth list also gives the alphabetical order, tabulating all the modifications of each letter-form. Gaudentius only enumerates the notes from  $\Omega$  upwards to N, but within these limits he gives all the letters. In the first list of Aristides, which contains two scales, each being composed of notes a tone apart, notes such

<sup>\*</sup> Meursius's view is now generally accepted. See Smith's Dict. Class. Biog., and Pauly's Classical Encyclopædia, 2nd revised edition. Stuttgart, 1866.

as A are necessarily omitted. That K and I in the third list fall next to each other in a scale by semitones artificially constructed for teaching purposes (one of those "catapycnose" scales which Aristoxenus expressly condemns as utterly foreign to the true principles of Greek music), proves no more than that K and I might occur in music a semitone apart, which no one dreams of denying (see, for example, "Mese" and "Trite Synemmenon" in the Æolian diatonic genus).

So much for Aristides and Gaudentius. Mr. Torr is quite right in "presuming that [my] notion is that this [among other reasons] will justify the transcript in giving D natural for K as well as I." I may add that Bellermann, Fortlage, Westphal, Riemann, Oscar Paul, and Gevaert

are of the same opinion.

Now as to the two different forms of pycnum. In the diazeugmenon tetrachord of the Æolian and Iastian keys (including the hyper- and hypo- scales) the notes skip a letter. In the remaining keys the letters are consecutive. If Alypius had regarded the pycna as identical in tuning, says Mr. Torr, he would not have needed the Æolian form at all, and could have used the other form throughout (p. 555, col. 1, ad init.). The simple answer is, that Alypius had no choice: he didn't invent the thing. It had come into existence certainly 700 years (and, according to Westphal, as long as 1,000 years) before he wrote. All he did was to put on record the signs used in practice, which signs, prior to the addition of the vocal notes, had passed through various stages of development, and which consequently exhibited many anomalies. It is terribly bad logic to say: "This is an anomaly; therefore it did not exist."
Our own notation is full of anomalies. That of the Greeks was more anomalous than ours, wherein there is nothing remarkable when one bears in mind the multiplicity of their tunings.

Mr. Torr's theory of the pycna necessitates the conclusion that certain kinds of tuning were confined to certain key-pitches; which is clean contrary to the testimony of the Greek writers. They all (except Aristoxenus) give a standard two-octave scale, to which every variety of generic tuning is applicable, and which may be transposed into all the various keys (tonoi or tropoi). Why does Ptolemy reject the Hypo-Iastian mode of the Aristoxeneans? Because, as he plainly states (Lib. II., c. 11, ad fin.), its intervals are exactly the same as those of the Hypo-Dorian or Hypo-Phrygian, only at an intermediate pitch. The key was, in fact, often spoken of as the "lower Hypo-Phrygian." Yet Mr. Torr would have us believe that the tuning of the *pycna* in this key was quite different from that in the other two. When he challenges THE MUSICAL TIMES to prove the contrary, he mistakes his position. It is he that is on the revolutionary side, and

it is for him to prove his case.

There is not the least difficulty, however, in disproving the contention that the pycnum K A M could not represent the chroma toniaion of Aristoxenus or the chroma syntonon of Ptolemy. In Book II., cap. 15, Ptolemy informs us that the only chroma used in his time was the syntonon, and that this chroma was employed in all the seven principal keys, in mixture with a form of the diatonic. Now six of these seven principal keys of Ptolemy happen to be just the keys which, in Alypius, always use the K  $\Lambda$  M form of pycnum. Ptolemy furnishes the ratios; Alypius furnishes the notation. Put the two side by side, and the whole reckless assumption of Mr. Torr falls to the ground.

I take Ptolemy's "Hypodorian ἀπὸ νήτης" (Table 7),

which, as he explains in the text, is the middle octave of the two-octave lyre, from the 5th string to the 12th inclusive (counting upward), the whole lyre being tuned according to the scheme in Book II., cap. 11, table 4. The lowest note of this octave is the "mese in power" (i.e., the "mese" of Alypius), and the octave is thus the upper half of Alypius's Hypodorian (see Bellermann, Op. cit., p. 13). Therefore we get:—



The distance between M and K is here  $\frac{8}{7}$ , something more than a full tone of  $\frac{9}{8}$ ; and it is clear that K has more than "moved into the place already occupied by I." has even moved past it. Or, to use Mr. Torr's other mode of expression, "the third note of one [instrumental] group" has most markedly been brought "into collision with the first note of the next group."

Had an Aristoxenean tuned the octave, and not a Pythagorean, K would of course fall exactly into the place of I, or (though the mode of expression is to be deprecated), "D flat would become D natural."

The mutual interference of group and group is also demonstrated by Boethius. In Book IV., cap. 3, he gives the letters of the Lydian mode in the three genera. Book IV., cap. 8, he calculates the exact ratios of the intervals in the same three genera, speaking in both cases, be it noted, not of the music of his own time, but of the epoch when the enharmonic was still in use. Reckoning from the "mese" (I) as 4,608, he proves that "paranete synemmenon" in the diatonic genus  $(\Gamma)$  and "paranete systemment in the diagonic genus (1) and "parameted diazeugmenon" in the enharmonic ( $\Delta$ ) are both represented by the same length of string, 3,888. But  $\Delta$  is the third note of one group, and  $\Gamma$  is the first note of the next

group.

It is highly remarkable that similar results are immediately obtainable, by simple arithmetic, from Mr. Torr's own admissions. O E N is a pycnum in the Hypo-Lydian chromatic, and may therefore, says Mr. Torr, represent two successive intervals of  $\frac{1}{3}$ -tone (chroma malakon). Hence 0 to N may be  $\frac{2}{3}$ -tone. Now 0 to M is only  $\frac{1}{2}$ -tone, for these notes are the "meses" of the Iastian and Phrygian keys respectively, which are known from Pseudo-Euclid, Aristides, Gaudentius, Bryennius, and (incidentally) Ptolemy to be a semitone apart. Therefore N may lie higher in pitch than M. But N is the third note of one group and M the first note of the next. Furthermore, Mr. Torr permits us to stretch O-N to  $\frac{3}{4}$ -tone (chroma hemiolion), and to compress M-A to 1-tone (as part of an enharmonic pycnum in Dorian key). Add the semitone O-M to the latter interval and we get O- $\Lambda$  equal to  $\frac{3}{4}$ -tonei.e., equal to O-N. Therefore  $\Lambda$  and N may be tuned to the same level of absolute pitch, M being squeezed out altogether. And  $\Lambda$  and N belong to different groups.

The foregoing three independent demonstrations completely annihilate the first objection to the transcript—viz., that if M and I denote C and D, K must belong to a note in between (p. 485, col. 2, ad init.). Pass we on to the second "set of doubts."

"There is no reason for supposing that the seven ['natural' or 'original' Greek notes] were exactly in the (p. 485, col. 2). I fear, Sir, that the inordinate length to which my letter has already run will prevent my fully investigating this question; so I will simply refer Mr. Torr to the opinions of the received authorities, who have made Greek music the study of a lifetime.

"Aristoxenus," says Bellermann (Op. cit., p. 22), "determines by ear the interval of the octave, and divides it by ear into six equal parts, which he calls whole tones. Each such tone he divides into two equal semitones-i.e., he

"Although the Greeks," says Westphal (Griechische Harmonik und Melopæie, third edition, 1886, p. 49), "had no inkling, apart from the Hydraulis, of modern keyed instruments, we must nevertheless suppose, according to the Harmonics of Aristoxenus, that the equally-tempered tuning occurring thereon was well known in the Greek musical Praxis."

Bellermann and Westphal are, of course, perfectly familiar with the passage Mr. Torr quotes from Aristoxenus (pp. 45-6). If Mr. Torr is acquainted with these authors, it is his business to refute them; and until he does this, THE MUSICAL TIMES is fully justified in following their lead. If, on the other hand, Mr. Torr is not acquainted with the standard works I cite, I submit that he is not qualified to discuss the question, much less to lay down the

Now, for the sake of argument, let us suppose that Bellermann, Westphal, and The Musical Times are all wrong as to the Aristoxenean tuning, and that Mr. Cecil Torr was born to put them all right. Here, expressed in mean ("equally tempered") semitones, is an exact view of the Aristoxenean intervals (tense diatonic) as Mr. Torr assumes them-



Where the middle tone is sharper than two mean semitones by the  $\frac{1}{25}$ th part of a mean semitone; the other tones are flatter than two mean semitones by the  $\frac{1}{125}$ th part of a mean semitone; and each semitone is flatter than a mean semitone by the  $\frac{1}{250}$ th part thereof. And Mr. Torr expects us to believe that these minute differences "vitiate the transcript." I say that it doesn't matter a button one way or the other; and that if this is the only offence (and that a doubtful one) that he has to allege, he might have spared ink and paper and the valuable space of THE MUSICAL TIMES.

Further: Mr. Torr entirely ignores the fact that our modern notation is by no means tied down to the expression of exactly equal semitones. Up to the end of the sixteenth century it was universally held to express Pythagorean (di-tonic) tuning. Thenceforward, up to the present moment, it has been very commonly employed to denote the following intervals:-



and the notes are often actually executed at these intervals by unaccompanied strings or trained quartet voices. The notation is, therefore, elastic within certain limits, and, in my opinion, is perfectly adapted to represent such a scale as Mr. Torr has put forward.

I submit that the above arguments form a complete

vindication of the transcript against the particular objections of Mr. Torr. I have not the least personal interest in M. Reinach one way or the other, and, if I thought him wrong, should say so without hesitation. Whether any conceivable arguments, however potent, will convince Mr. Torr, is problematical; but I am content to leave the decision to impartial judges.—I am, Sir, yours, &c., ERNEST BERGHOLT.

London, September 3, 1894.

#### THE HYMN TO APOLLO.

TO THE EDITOR OF "THE MUSICAL TIMES."

SIR,-In your note at the end of my letter in your September number (pp. 626, 627) you take exception to my statement that "the K A M form fits the three cases in Aristoxenus where the pycnon has intervals of a quarter, In A M form fits the fourth case, where the pycnon has intervals of half-a-tone." You say that you are at a loss to discover what grounds I have for "this very large assumption." Surely the grounds are obvious. interval of a tone between I and M; so the I A M form fits the case where the pycnon has intervals of half-a-tone. And as K comes between I and M, there is an interval of less than a tone between K and M; so the K  $\Lambda$  M form fits the cases where the pycnon has intervals of less than half-atone. I maintain that, as the K A M form is employed in the hymn, the hymn had pycna with intervals of less than half-a-tone.

I must confess that I am rather puzzled by your statement that "nothing that Mr. Torr has said has caused us to ment that "nothing that Mr. Torr has said has caused us to alter our opinion that M. Reinach's transcript is perfectly correct as regards the notes; and that in all probability the tuning employed was the *toniaion*, though either of the others is perfectly possible." I observe that you qualify your opinion that "the transcript is perfectly correct" with the words "as regards the notes"; so I suppose that you have come to share my views about the use of equal temperament. But the transcript cannot be perfectly correct as regards seven the transcript cannot be perfectly correct as regards seven of the fourteen notes, unless the tuning was the toniaion, what I have seen personally, with the exception of

for it determines the position of these seven notes by reckoning that the pycna had intervals of exactly half-atone. Nevertheless, you say that it is perfectly possible that the tuning was not the *toniaion*, though in all probability it was. This only seems to be another way of saying that in all probability these seven notes are right, but that it is perfectly possible that they are wrong.

In his letter, Mr. Bergholt quotes a statement of mine

that, inasmuch as there were twenty-one signs for notes in the octave, there must have been twenty-one notes. this he "infers" that my contention is that the twenty-one signs represented twenty-one notes at fixed intervals. And the rest of his letter is occupied in showing that the intervals could not be fixed. I am not going to write a defence of views that are not mine; but I may remark that Mr. Bergholt would have some trouble in establishing his postulates that the tone was always a major tone, and that the fourth was always a perfect fourth.—Yours, &c.,

Cecil Torr.

We consider that our readers are now in possession of sufficient evidence for and against the accuracy of Mr. Reinach's transcript to enable them to form their own opinion. Correspondence on the subject must therefore now cease.—ED., M.T.

#### HOW COMPOSERS COMPOSE.

TO THE EDITOR OF "THE MUSICAL TIMES."

SIR,—Much well-bred scorn has been recently evoked by the innocent suggestion, to be found in a column of your journal, that "some eminent composers have the habit of resorting to a keyed instrument when scoring." The idea that such a thing ever occurs "creates amusement in the mind of any musician." Any composer detected in such quote Shakespeare) that he ought to be "written down an ass." None but the veriest amateur would are an act would at once admit (if he had brains enough to None but the veriest amateur would ever rush to the pianoforte or organ when orchestrating, as none but a tyro swimmer would use corks.

Let us see which view denotes most unfamiliarity with the modus operandi of composers. I am not straining to concoct a clever paradox, but to ascertain a sober matter of fact.

I regret to have to resuscitate, even for a moment, the inscription on the Whitchurch organ-more calculated, I fear, to produce a cold shiver in your readers than that on the wall in the Biblical monarch; and I note the humorous comparison to which I expose myself with Uncle Dick ("David Copperfield"), who could not keep King Charles's head out of the memorial. It is, alas! in indirect connec-

tion with my uncle's brass plate that the point has arisen. The hapless plate says "Handel" (in deference to your habit I have abandoned the native orthography of the great Saxon's name) "composed Esther on this organ": hinc illæ lacrymæ! In these latter days of research, a crowd of busy mockers start up and say, "none but a musical dunce would attach any definite meaning to this absurd statement." The idea of the composer, who more than all others was noted for the flow of melody welded to counterpoint which gushed from him automatically, being obliged to verify his ear, or assist his invention by mechanical means! Here we have the fallacy which underlies the whole objection, and brings us to the point. The objectors will persist in assuming that the only reason for a composer trying phrases over on an instrument is necessity for aid to an untrained ear. The reverse is the case. The idea that this implies weakness is the popular, and what Von Bülow would call the "naturalistic" view, founded on our experience of the fashionable lady valse composer, who (to punish the sine of the community) is gifted with a little of the community of punish the sins of the community) is gifted with a diabolical power of stumbling on a washy tune in the course of chance-meandering over the keys. Let us follow the process of evolution by steps. The next stage is the student, who has been learning to score, say, three or four months; if he has ordinary aptitude he will have arrived at the point when it is easier for him to forget that there is such a thing as a pianoforte. We come next to the erudite musician, and in this class the mode of trans-



 $\label{lem:constructions} \mbox{ Aristides Quintilianus and Constructions in Early Music Theory}$ 

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# ARISTIDES QUINTILIANUS AND CONSTRUCTIONS IN EARLY MUSIC THEORY

Aristides Quintilianus' dates are not known, but he can hardly be earlier than the first century A.D. or later than the third. Several passages in the early pages of his de Musical purport to record facts about the practice of much older theorists, in contexts which make it clear that his references are to the period before Aristoxenus. Since our knowledge of music theory in that period is extremely sketchy, it is obviously worth trying to assess the reliability of Aristides' information. Two of his references have often been recognized as being of special interest, and there is a third, to which, I shall argue, the other two are intimately related. The first (12. 12 to the end of the diagram on 13) records two systems of notation, alleged by Aristides to have been used by of  $\dot{a}\rho\chi a\hat{i}oi$ . The second (18. 5 to the end of the diagram on 20) is the famous, or notorious, account of certain 'divisions of the tetrachord' which were employed by of  $\pi \acute{a} \nu \nu$ παλαιότατοι πρὸς τὰς άρμονίας. It is these, Aristides tells us, which are mentioned by Plato in the Republic.<sup>2</sup> The remaining passage (15. 8–20) is superficially rather less exciting: it records the names and initial notes of the  $\delta \rho \mu o \nu (a)$ , or forms of octave scale, said to have been distinguished by of  $\pi a \lambda a \iota o i$ , and says something about a method by which the  $\pi o i \delta \tau \eta s$  of each can be made clear. The information given here about the nature of the  $\dot{\alpha}\rho\mu\nu\nu'i\alpha\iota$  is familiar: it is to be found, for example, in Cleonides Eisagoge 19. 4 ff., where rather more detail is given, and where the names of the άρμονίαι are again ascribed to οἱ ἀρχαῖοι (19. 7: cf. also 'Bellerman's Anonymous' 62). I shall suggest, however, that Aristides' version has independent interest. What he tells us in the first two passages is found nowhere else.

I shall argue, somewhat indirectly, that Aristides' information has a claim to be considered authentic, and that it helps in certain respects with the interpretation of the text of Aristoxenus himself. I shall approach this conclusion by seeking to establish something about the form in which the information was transmitted to him. It may be too ambitious to make any claims about the actual vehicle of this transmission (though I shall make some tentative suggestions), but it may be possible to reconstruct certain aspects of the manner in which the information was expressed. This will provide some clues to the date of the original source, though that may of course not have been what Aristides had in front of him.

The 'divisions' of 18. 5 ff. form a set of scales displaying marked oddities. Some of them cover an octave, some less, and one a tone more. Their internal structures are sometimes irregular: some also contain gaps where, in the formalized post-Aristoxenian systems, one would expect notes, and some include notes where one would expect an undivided interval. These eccentricities are not (or certainly not all) due to corruption in the text of Aristides, since he himself remarks on several of them; and they are in themselves some evidence of the antiquity of the forms they record. So far as that goes, they might well represent types of  $\delta\rho\mu\sigma\nu'\alpha$ , patterns of tuning, which pre-date the orderly systems of the late fourth century.<sup>3</sup>

<sup>&</sup>lt;sup>1</sup> The most recent edition is that of Winnington-Ingram (Teubner, Leipzig, 1963). All references to Aristides in this paper are to the pages and lines of that editon.

<sup>&</sup>lt;sup>2</sup> Rep. 398e2-399a4.

<sup>&</sup>lt;sup>3</sup> The details are discussed in R. P. Winnington-Ingram, *Mode in Ancient Greek Music* (Cambridge, 1936), pp. 21–30. See also the works referred to in his n. 2, 22.

Aristides sets them out in two ways. First, he lists the sequence of intervals which each incorporates. His lists are given in terms of tones, quarter-tones, and so on. This fact suggests one immediate conclusion: his source, whatever it was, did not belong to the 'Pythagorean' tradition which represented intervals as numerical ratios. Two of the intervals mentioned, the diesis or quarter-tone and the τριημιτόνιον, three semitones, cannot be given exact equivalents in Pythagorean ratio theory, and no Pythagorean would have agreed that the octave consists of six tones, as this passage requires. Nor would Aristides have had any motive for 'translating' a set of Pythagorean ratios into the terminology of quarter-tones and semitones, giving the nearest equivalents he could find, since he is elsewhere perfectly happy to retain the ratio formulation. Despite the reference to Plato, then, the source is unlikely to have been anyone working in close association with the Academy, whose language and presuppositions are always, in this respect, Pythagorean.

Aristides' second exposition of the divisions is for present purposes unhelpful. It consists of tables of notes displaying the interval structures previously set out in words, and the notes are indicated by the symbols of the so-called 'Alypian' system.8 Though this system is certainly much older than Aristides, it equally certainly does not go back as far as Aristoxenus, whose main surviving discussion of notation presupposes, as we shall see, a scheme of a totally different type. If the source used the Alypian system, it is probably to be located in the second century B.C. or later. But it seems much more likely that the tables were constructed by Aristides himself, on the basis of information which he had seen in a form more closely corresponding to his first exposition: this appears to be implied in the way he introduces them –  $\sigma \alpha \phi \eta \nu \epsilon i \alpha s$   $\delta \epsilon \epsilon \nu \epsilon \kappa \epsilon \nu \kappa \alpha i$ διάγραμμα τῶν συστημάτων ὑπογεγράφθω (19. 1–2). A rudimentary attempt appears to have been made to make all the scales relate, in a more or less orthodox way, to one particular note, that indicated by the symbol C: whoever transferred the interval structures to the tables was evidently anxious to represent at least one note (and there is only one which all the tables share) as 'fixed' in the Aristoxenian sense.9 But the Aristoxenian analysis is clearly inappropriate to these scales: the representation is the work of someone attempting to interpret disorderly archaisms to an audience schooled in the systematic patterns which theorists had themselves imposed.

Of the two systems of 'ancient notation' preserved at 12. 12 ff. I shall say little at present. The symbols they use are quite different from those of Alypius, and the basis on which they are organized is different too. They apparently represent degrees on a continuum of pitch divided at equal intervals, the first into quarter-tones, the second into semitones. Each covers an octave, and there is no suggestion that this octave had any particular pitch. The notation gives a way of representing divisions of the octave

- <sup>4</sup> A careful exposition of the differences between Pythagorean and Aristoxenian approaches to the expression of intervals will be found at Ptolemy, *Harmonics*, 1. 5 and 9 (11–12 and 19–21, During).
  - <sup>5</sup> See e.g. the Euclidean Sectio Canonis, proposition 14.
  - <sup>6</sup> Very frequently, e.g. lines 4-9, and throughout Bk. III.
- <sup>7</sup> Following the example set by *Timaeus* 35bl-36d7. Cf. the qualified approval given to Pythagorean musical theory at *Rep.* 531cl-d4, and Plato's contempt for their 'empiricist' rivals, 531a4-b9.
- <sup>8</sup> Named after Alypius (probably third century A.D.), whose *Eisagoge* sets out the tables of this notation in full. But its origin is certainly much earlier.
- <sup>9</sup> The 'fixed' notes (τὰ ἡρεμοῦντα, φθόγγοι ἀκίνητοι, μένοντες) are those which do not change with changes of genus, and thus provide a constant framework within which variations may occur. The intervals between them are determinate, whereas those involving the 'movable' notes are flexible. See e.g. Aristoxenus, *Harm.* 21. 32 ff., 33. 32–4, 46. 19–23.

at any arbitrary locus. Chailley<sup>10</sup> has argued convincingly that they correspond in all important respects to the system of notation mentioned and criticized by Aristoxenus at *Harm*. 39–40. No trace of their use has been found elsewhere. It seems likely that they reproduce a system used by theorists – almost certainly not by composers – at a date around that of Aristoxenus or a little earlier.

At 15. 8–20 Aristides presents a list of the  $\delta\rho\mu\nu\nu\ell\alpha\iota$  distinguished by of  $\pi\alpha\lambda\alpha\iota\iota\iota$ , which are Mixolydian, Lydian, Phrygian, Dorian, Hypolydian, Hypophrygian, Hypodorian. These are not to be confused with the  $\tau\delta\nu\iota\iota$ , or transposition scales, of Aristoxenian theory, despite the similarity of their names. They are designated as  $\epsilon\iota\delta\eta$   $\tau\iota\iota\iota$ 0  $\delta\iota\iota$ 0  $\delta\iota$ 1  $\tau\iota$ 1  $\tau\iota$ 2  $\tau\iota$ 3 forms or arrangements of the octave – structures much more like 'modes' than keys or transposition scales. That is, they differ from one another, as Aristides' description makes clear, in the order of the intervals which they contain. He distinguishes them as beginning from different notes: but he goes on to say that if in each case you begin from the same  $\sigma\eta\mu\epsilon\iota\iota\nu$ 0, giving it for each  $\delta\iota\rho\mu\nu\nu\iota\iota$ 0 a name corresponding to a note different in respect of function, the succession of notes which follow will make clear the  $\tau\iota\iota\iota\iota\nu$ 1 of each  $\delta\iota\iota\iota\iota\nu$ 2 of each  $\delta\iota\iota\iota\iota\iota\nu$ 3.

The point is quite straightforward. The 'functionally named' notes from which the  $\delta\rho\mu\nu\nu'i\alpha\iota$  are said to begin are, in order, hypate hypaton, parhypate hypaton, diatonos (= lichanos) hypaton, hypate meson, parhypate meson, diatonos (= lichanos) meson, mese. These names indicate notes which, in any given genus, stand at fixed intervals from one another. It is legitimate to assume that Aristides is here referring to a scheme applied in the enharmonic genus, 11 in which the intervals separating the notes named are, in order, quarter-tone, quarter-tone, ditone, quarter-tone, quarter-tone, ditone. (In the sequel I shall abbreviate 'quarter-tone' as 'q' and 'ditone' as 'd': 'tone' will later appear as 't' and 'semitone' as 's'.) Since the  $\delta\rho\mu\nu\nu'i\alpha\iota$  are explicitly described as octaves, and Aristides gives no hint that their interval structures are in any way unusual, we must suppose that the scales follow the disjunct series, in which the interval above mese is a tone, followed by a repetition of the tetrachord q, q, d. It can then be seen that octave scales beginning from the seven notes mentioned will differ in form from one another, following the sequence

 Mixolydian
 q, q, d; q, q, d; t

 Lydian
 q, d; q, q, d; t; q

 Phrygian
 d; q, q, d; t; q, q

 Dorian
 q, d; t; q, q, d

 Hypolydian
 q, d; t; q, q, d; q

 Hypophrygian
 d; t; q, q, d; q, q

 Hypodorian
 t; q, q, d; q, q, d

There is nothing even mildly controversial about this interpretation. It corresponds exactly to what Cleonides tells us in the passage mentioned above. Aristides' remark that the  $\pi o i \acute{o} \tau \eta \tau \epsilon s$  of these  $\acute{a}\rho \mu o \imath \acute{a}\iota$  will be revealed if we begin them all from the same  $\sigma \eta \mu \epsilon \acute{a}o \nu$  also seems readily comprehensible: he means that if we begin them all at the same point of pitch, but designate this differently 'in respect of function' (i.e. in respect of its location in the series of named notes which mark out the sequence of intervals), the natural sequence of functionally named notes will map on to one and the same range of pitch, in such a way as to make their different structures easy to compare.

<sup>&</sup>lt;sup>10</sup> J. Chailley, 'La notation archaïque grecque d'après Aristide Quintilien', *Revue des Etudes grecques* 86 (1973), 17–34. More briefly in his *La Musique Grecque Antique* (Paris, 1979), 121–5: see especially 123, n. 2.

<sup>&</sup>lt;sup>11</sup> Aristoxenus 2. 7–25. Aristides is not explicit on this point.

Now it is obvious that this set of structures belongs to a later date and a higher level of systematization than do the divisions allegedly relating to the άρμονίαι of the Republic. But equally our evidence indicates that they pre-date Aristoxenus. Though the orderings of intervals which they embody in no way conflict with his doctrines, their attribution to οἱ ἀρχαῖοι by Cleonides, who follows Aristoxenus slavishly, makes it clear that they were not Aristoxenus' invention. Nor does anything in Aristoxenus' extant work suggest that he was much concerned with such constructions: the focus of his analysis lay elsewhere, as I shall explain below. Further, there are references in Aristoxenus himself to structures discussed and explicated by his predecessors, which can hardly be any but these. He tells us that the 'harmonicists', by which he means all his precursors, failed to study the nature and interrelations of magnitudes other than the octave, confining themselves to ὀκταχόρδων ἐναρμονίων (2. 17). In another passage (36. 30) he speaks of them as considering nothing but αὐτῶν μόνον rightly emended  $\dot{\epsilon}\pi\tau\alpha\chi\delta\rho\delta\omega\nu$  to  $\dot{\epsilon}\pi\tau\dot{\alpha}$   $\dot{\delta}\kappa\tau\alpha\chi\delta\rho\delta\omega\nu$ . They are not relying only on 2. 17, and on the general consensus that the word 'άρμονία' almost always designates the octave in works of this period.<sup>13</sup> A more important clue comes from 6. 13 ff., where Aristoxenus explains that one of his predecessors, Eratocles, 'attempted to enumerate the arrangements of the (enharmonic) octave, displaying them by moving the intervals around cyclically'  $(\tau \hat{\eta} \pi \epsilon \rho i \phi o \rho \hat{\alpha} \tau \hat{\omega} \nu \delta i \alpha \sigma \tau \eta \mu \acute{\alpha} \tau \omega \nu, 6.24)$ . An 'arrangement'  $(\sigma \chi \hat{\eta} \mu \alpha, \phi \sigma \dot{\eta} \mu \dot{\alpha})$ elsewhere also  $\epsilon l\delta os$ ) in Aristoxenus' terminology is an ordering of a collection of intervals whose number and magnitude are already determined (74. 9-17). The reference to 'cyclic' rearrangement may reliably be interpreted as follows. If we begin from the standard structure of the enharmonic octave, q, q, d; t; q, q, d, we can generate new arrangements by 'moving the intervals around', that is, by first moving the lowest interval from the bottom of the series to the top, producing q, d; t; q, q, d; q, then the second interval, giving d; t; q, q, d; q, q, and so on. As Aristoxenus says, this will generate seven arrangements (6. 30); and he asserts that although it is only this group of seven which Eratocles 'enumerates' ( $\xi \epsilon \rho \iota \theta \mu \hat{\eta} \sigma \alpha \iota$ , 6. 22) and 'displays' (δεικνύς, 6. 25), he has done nothing, though he should have done, to rule out the legitimacy of arrangements not generated by this procedure. (Examples would be q, q, t, d, q, q, d, or q, q, d, t, d, q, q, and there are many others.)

It is obvious that this procedure, and the octave  $\delta\rho\mu\nu\nu\ell\alpha\iota$  which it generates, correspond exactly to what Aristides is talking about at 15. 8 ff. Though he puts it differently, the procedure which generates his seven  $\delta\rho\mu\nu\nu\ell\alpha\iota$  is precisely that of cyclic rearrangement; and there is no serious room for doubt that the two authors are discussing the same system. The question I want to focus on is whether the additional manoeuvre mentioned by Aristides, that of starting all the  $\delta\rho\mu\nu\nu\ell\alpha\iota$  from the same  $\sigma\eta\mu\epsilon\hat{\iota}\nu$  for the purposes of comparing their structures, also finds an echo in Aristoxenus. I believe that it does, and that this echo has interesting implications for the question about transmission with which we began.

The issue will hang on our understanding of a procedure which Aristoxenus ascribes to his predecessors, and which he calls *katapyknosis*. The term means, roughly, 'close

<sup>&</sup>lt;sup>12</sup> See the edition of R. da Rios (Rome, 1954), app. crit. to 46. 9, and her translation, p. 53, n. 2. Chailley's proposal (op. cit. p. 38) to retain the MSS reading runs into difficulties which I shall discuss later.

<sup>&</sup>lt;sup>13</sup> Asserted by e.g. Nicomachus, Enchiridion 9; cf. Aristides Quintilianus 15. 8–10, Plato, Rep. 617 b 6–7. But there is some vacillation about this: cf. Aristotle, Metaph. 1093 a 14. The supposedly older heptachord scales were at least sometimes called άρμονίαι, e.g. in ps.-Ar. Problems, 19. 7, 918 a 13, and 25, 919 b 21. The divisions of Aristides Quintilianus 18–20 constitute another kind of exception (see 18. 6, 19. 8).

packing' or 'compression'. The references in Aristoxenus make it clear that it had an association with certain *diagrammata* on which earlier theorists had represented the interval structures of the enharmonic octave (7. 22 ff., 28. 1). Whether the term refers to the 'close packing' of intervals in the diagram or the 'compression' of the diagram itself is a question which will concern us later.

There is general agreement about the approximate nature and function of the procedure. The diagrams apparently took the form of a line divided into equal segments, each representing a quarter-tone. The aim was to map on to the diagram the structures of accepted (or postulated) enharmonic forms of the octave. Whichever interpretation of the word 'katapyknosis' we choose, it evidently designates the attempt to fit all the relevant intervals and arrangements of the scale into as small a compass as possible, presumably with a view to simplifying the task of quantifying and comparing – perhaps visually – the interval structures of each.

So much is relatively uncontroversial. Problems arise when we try to reconstruct in detail the way in which the mapping was done. The reconstruction offered by Macran in his edition of Aristoxenus<sup>14</sup> looks plausible, but meets with difficulties; I have not come across any equally detailed alternative.

Any reconstruction must try to take into account the following points.

- (i) The diagrams were used only to represent enharmonic octave *systemata*, though they actually displayed  $(\epsilon \delta \hat{\eta} \lambda o v)$ : the sense seems to be 'could have accommodated') 'the whole of melodic order'  $(\tau \hat{\eta} v \pi \hat{a} \sigma a v \tau \hat{\eta} s \mu \epsilon \lambda \omega \delta (a s \tau \hat{a} \xi v)$ . In the context this last phrase must mean 'comparable *systemata* in the other genera as well as the enharmonic' (2. 12 ff.).
- (iii) The diagram is said to involve a series of 28 consecutive dieses, quarter-tones. This, Aristoxenus asserts, represented continuity,  $\tau \delta \in \xi \hat{\eta}_S$ , to the harmonicists (27. 34–28. 10). Macran appears to think that this means that the 28-diesis range was full; that is, every pitch on it was occupied by at least one note in one form of the scale or another. I shall offer an alternative interpretation. Attempts have been made to emend '28' to '24', on the grounds that there are only 24 dieses in an octave. Here Macran's defence of '28' is probably on the right lines, but the question may be left open for the moment.

Little more can be gathered from Aristoxenus' direct references to *katapyknosis* and the diagrams, but it is worth recalling two other claims which he makes about his predecessors, which we have already noticed. They are

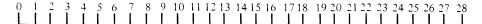
- (iv) that Eratocles attempted to enumerate the arrangements of the octave, 'displaying them by moving the intervals around cyclically' (6. 13 ff.), and
- (v) that none of his predecessors made any systematic study of 'magnitudes',  $\mu\epsilon\gamma\epsilon\theta\eta$ , other than the octave. I shall also need to refer to the claim that
- (vi) the school of Eratocles noted the fact that the melodic sequence 'splits in two as it moves in either direction from the interval of a fourth' (5. 9 ff.). This is usually, and I think rightly, understood as a reference to the alternatives of conjunction and disjunction as methods of linking successive tetrachords. When we reach the highest

<sup>&</sup>lt;sup>14</sup> The Harmonics of Aristoxenus ed. H. S. Macran (Oxford, 1902), pp. 229–32. What I shall call his 'reconstruction' is constituted by the tables of notes on 231.

<sup>15</sup> By Ruelle, following Meibom's note. See da Rios op. cit., app. crit. to 36. 5-6.

note of the first tetrachord we may continue the scale *either* by treating the note we have reached as the lowest note of the second tetrachord (conjunction), *or* by beginning the second tetrachord on a note at an interval of a tone from the last note of the first (disjunction) (see 58. 14–59. 5). An enharmonic tetrachord typically has the form q, q, d: a sequence of such tetrachords may have the conjunct form q, q, d; q, q, d;..., or the disjunct form q, q, d; t; q, q, d;...Aristoxenus criticizes the Eratocleans' work on this subject on various grounds; these, though of interest in their own right, need not concern us here.<sup>16</sup>

In the light of these points we should first consider Macran's reconstruction. He sets out his version of the seven octachords, labelled with the names found in Aristides and Cleonides, on a set of musical staves. It will be more convenient for present purposes to represent them differently, and perhaps more in the manner of the harmonicists themselves. Their diagram was a line, divided equally into quarter-tones. If we draw such a line, with the bottom of the scale to the left, we can number the notes marked on it, with 0 as the first, and refer to the notes in our scales by their numbers on the diagram.



For each of the *systemata* (or *harmoniai*) I shall give first its interval structure, which corresponds exactly with that implied by Aristides and set out previously, and secondly the numbers corresponding to its notes according to Macran's version.

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Mixolydian q, q, d; q, q, d; t 4, 5, 6, 14, 15, 16, 24, 28
Lydian q, d; q, q, d; t; q 2, 3, 11, 12, 13, 21, 25, 26
Phrygian d; q, q, d; t; q, q 0, 8, 9, 10, 18, 22, 23, 24
Dorian q, d; t; q, q, d 5, 6, 7, 15, 19, 20, 21, 29
Hypolydian Hypophrygian d; t; q, q, d; q, q 1, 9, 13, 14, 15, 23, 24, 25
Hypodorian t; q, q, d; q, q, d 6, 10, 11, 12, 20, 21, 22, 30
```

The scheme works well at several points. It plainly conforms to the requirements of points (i) and (v), and also to those of (iv), since the different systemata are generated by cyclic rearrangement. Macran also takes it to reflect the claims made in (ii), which he takes to imply the thesis that the arrangement of scales in the katapyknosis diagrams was inconsistent with the possibility of modulating from one to another, according to the canons which Aristoxenus laid down. Unfortunately we know little directly about Aristoxenus' views on modulation. Macran, however, is arguably right in supposing that the intervallic relations between the fixed notes of one systema and another were important, and particularly those between what he rather misleadingly calls 'tonics', the mesai in the sense distinguished by Ptolemy as mesai kata dunamin. <sup>17</sup> In these systemata the mese is in each case the note immediately below the interval of a tone. If we may, as Macran does, <sup>18</sup> read back the views of Bacchius on modulation

7

<sup>&</sup>lt;sup>16</sup> He argues that they have not discussed the question whether bifurcation of the series may take place after just any form of the (enharmonic) fourth (e.g. q, d, q) or only after one privileged form (this will be q, q, d). Various propositions in Bk. III seem expressly designed to fill this gap, and to prove the impropriety of disjunction after any other arrangement of the fourth (see 65. 30–66. 8, 66. 9–17, 71. 23–72. 11). But Aristoxenus does not say, and almost certainly does not mean, that the Eratocleans posited disjunction at any points which he himself does not recognize: he means that they have omitted to show why such rogue disjunctions are impermissible.

<sup>&</sup>lt;sup>17</sup> Ptolemy, *Harmonics* 2. 5 (51, During). On the importance of relations between *mesai* cf. Cleonides, *Eisagoge* 23. 14 ff.

<sup>&</sup>lt;sup>18</sup> Macran, op. cit. pp. 262–6. See also Cleonides 26. 19 ff. and Aristides Quintilianus 22. 11–26.

into Aristoxenus, we reach (after some complex working) the conclusion that the only systemata between which modulation, direct or indirect, is possible, are those whose mesai are separated by a semitone or a multiple of a semitone. In Macran's reconstruction the mesai of the octachords are, in order, 24, 21, 18, 15, 12, 9, 6. The interval separating each from its neighbour is thus three-quarters of a tone, and hence modulation between adjacent octachords is impossible. In fact it turns out to be impossible between any pair of octachords, since none of the intervals at which direct modulation is permitted occurs. (These are the tone, the fourth, the fifth, and five tones, 19 none of which is a multiple of three-quarters of a tone.)

So far so good: but there are two major difficulties. One is that the reconstruction patently conflicts with point (iii). Certainly it does involve 28 consecutive dieses, but only in the sense that it involves at least that number, since it incorporates 30. If the diagrams Aristoxenus met ran to 30 dieses, he would undoubtedly have said so, since part of his polemical point is that they string together far too many. Macran, for reasons he does not explain, focuses only on one octave within the total range of his structure, running in his formulation from F to f, and in the present one from 4 to 28. This contains 24 dieses, but we are not told why we should leave out of account the notes numbered 0, 1, 2, 3, 29, and 30. His defence of the reading '28' at 28. 7, which I shall look at further below, implies that a set of octave scales would have been represented within a range of 24 dieses. (The additional four are explained by the hypothesis that one at least of the scales represented covered the range of an octave plus a tone.) Why then does his reconstruction demand 30?

Secondly, Macran gives no explanation of why he arranges the seven systems at these particular distances from one another. Nothing in the information we have underwrites the spacing of *mesai* at intervals of three-quarters of a tone; and although the series of initial notes, 4, 2, 0, 5, 3, 1, 6 displays a certain pattern, it does not look like a pattern that would have been deliberately sought for its own sake. It is hard to resist the conclusion that he has spaced them in this way precisely in order to generate the result that modulation is impossible. But it can hardly have been the intention of the harmonicists to rule out modulation, and I can conceive of no other rationale for choosing this particular set of relations. It seems most unlikely to have been adopted merely by chance. Further, Aristoxenus does not say that their diagrams make modulation impossible: he says that they said something about it briefly and accidentally, while actually pursuing a different objective. Aristoxenus pulls no punches; and if the diagrams genuinely had the consequence which Macran's version does, he would hardly have been able to resist drawing attention to the fact.

Any rival reconstruction must begin by trying to reduce the number of consecutive dieses. This cannot be done without a fairly radical revision of Macran's approach to the problem. The *systemata* must each cover an octave, 24 dieses. There are seven of them, so that if we are to place their starting points on different notes, a minimum of a diesis apart, we are bound to add six dieses to the total range covered, producing Macran's 30.

One solution would be somehow to abbreviate the *systemata*. The obvious way of doing so is to take them to be not the octave-spanning octachords of the disjunct system, such as q, q, d; t; q, q, d, but heptachords of the conjunct system, q, q, d; q, q, d, which span a tone less. Plainly this will reduce the range of the diagram, though it will make it 26 dieses, not 24 or 28. But the suggestion will not do. Aristoxenus' references to octave scales are clear (even if the text as we have it speaks in one place of heptachords rather than octachords); more decisively, cyclic rearrangement of the

<sup>&</sup>lt;sup>19</sup> Macran, op. cit. p. 266.

intervals of the conjunct series will not produce seven arrangements, but only three, q, q, d; q, q and q, d; q, q, d; q and d; q, q, d; q, q. With the next move we are back to the original form.

A second manoeuvre would be to eliminate one of the two bounding notes of each of the octachord octave sequences, on the grounds that since they stand at an octave to one another they are effectively the same note, and one must be redundant. The higher of the two is to be considered as the starting point for the second octave, not the end of the first. This approach has two advantages. It would give an explanation for the apparent vacillation between talk of octachords and talk of heptachords. Secondly, it enables us to reduce the span of the diagram to 28 dieses. Macran's own reconstruction cannot be refurbished in this way, since if we simply remove the higher octave note from each of his scales we shall again be left with a range of 26 dieses, not 24 or 28. There are, however, a number of ways in which it can be done, of which the most attractive is that which retains Macran's and Aristides' order of  $\delta \rho \mu o \nu i \alpha u$  but spaces their starting points at intervals of one diesis, the highest belonging to Mixolydian. This will yield the sequence

Mixolydian
Lydian
6, 7, 8, 16, 17, 18, 26 (30)
5, 6, 14, 15, 16, 24, 28 (29)
Phrygian
4, 12, 13, 14, 22, 26, 27 (28)
Dorian
3, 4, 5, 13, 17, 18, 19 (27)
Hypolydian
Hypophrygian
Hypodorian
4, 12, 13, 14, 22, 26, 27 (28)
1, 1, 15, 16, 17, 25 (26)
1, 9, 13, 14, 15, 23, 24 (25)
0, 4, 5, 6, 14, 15, 16 (24).

The numbers in parentheses complete the octaves, and are deemed redundant on the basis discussed above.

We may tighten up the diagram more thoroughly. According to Macran's conception of  $\tau \delta \in \xi \hat{\eta}s$ , continuity, the scales deployed should make use of 24 or 28 consecutive dieses. But in our set of systemata three positions in the series are empty, numbers 10, 20 and 21. My calculations have yielded no sequence, built on the present principle and organized according to a non-arbitrary system of spacing and ordering, which displays no such gaps. But in certain sequences, including this one, they can be filled if we add in to the diagrams the notes of the conjunct series. Such an addition would be consistent, as we have seen, with the work of at least one group of Aristoxenus' predecessors. Thus we have seven abbreviated octave scales, each with its five-tone conjunct variant, represented on a continuous series of 28 dieses; since they begin on different notes and have their mesai quite intelligibly placed, they might be conceived as having something to do with modulation; and the series of consecutive dieses separating their initial notes indicates a perfectly sensible methodology behind their arrangement – in this they differ markedly from Macran's.

But I do not think that the hypothesis from which they begin can stand. Our authorities are almost unanimous in treating octave scales as ones which include the highest note, rather than merely implying it, and as containing eight notes, not seven.<sup>21</sup>

<sup>&</sup>lt;sup>20</sup> The notes of the conjunct versions of these *harmoniai* will be as follows: Mixolydian, 6, 7, 8, 16, 17, 18, 26; Lydian, 5, 6, 14, 15, 16, 24, 25; Phrygian, 4, 12, 13, 14, 22, 23, 24; Dorian, 3, 4, 5, 13, 14, 15, 23; Hypolydian, 2, 3, 11, 12, 13, 21, 22; Hypophrygian, 1, 9, 10, 11, 19, 20, 21; Hypodorian, 0, 1, 2, 10, 11, 12, 20. Thus 10 and 20 are supplied by Hypophrygian and Hypodorian, 21 by Hypolydian and Hypophrygian.

<sup>&</sup>lt;sup>21</sup> The only seven-note scales generally referred to are those of the conjunct system, spanning five tones. The alleged innovator who 'added the eighth note' is commonly thought of as thereby completing the octave. See e.g. Nicomachus, *Enchiridion* 5. The main exception is ps.-Ar.

The trick of abbreviation by which our result was achieved is nowhere mentioned, and had it been in use we would surely have heard about it, since it is such a convenient and economical device.<sup>22</sup>

I suggest that we can properly resolve the difficulties only be re-examining our assumptions at two crucial points. The first concerns the relevance of the harmonicists' procedure to questions about modulation. I have already noted that Macran's interpretation of Aristoxenus' comments is unjustified: the arrangement need not be such as to make modulation impossible. It should now be added that it need not even be such as to require that the various άρμονίαι begin from different notes. Quite the contrary: one way of approaching the topic of modulation between different octave forms would be to start each form on the same note, thereby displaying facts of three kinds: (a) that if a melody begins in e.g. the Dorian ἁρμονία, and moves from the position mapped as the lowest note through a quarter-tone upwards, no μεταβολήis involved, whereas if it moves, for instance, through a ditone, it has shifted to Phrygian or Hypophrygian; (b) that – beginning again from some particular  $\dot{a}\rho\mu\sigma\nu\dot{a}$  – a given interval placed at one point in the system will not generate modulation, whereas placed at another it will;  $^{23}$  and (c) that there are only certain positions at which  $\mu \epsilon \tau \alpha \beta o \lambda \dot{\eta}$  between a given pair of systemata is consistent with the pattern of relations which the diagram displays. Since, for example, the note one diesis from the bottom does not occur in Phrygian, we cannot modulate into the Phrygian from the Dorian at that point in the series.

This approach to modulation is certainly not Aristoxenian. As far as we can judge, the question he asks is not 'How can we move from one form of the octave to another?', but 'At which intervals can we move from a systema in a given range of pitch to a systema of identical form at another range of pitch?'24 The relationally pitched set of structurally identical systemata are the  $\tau \acute{o}\nu o\iota$ , or 'keys', 25 and it is these, not the  $\dot{\alpha}$ ρμονίαι, which are central to Aristoxenus' theory of  $\mu \epsilon \tau \alpha \beta o \lambda \dot{\gamma}$ . But the questions are in a certain sense equivalent. In practice, moving from the Dorian άρμονία based on a certain pitch to the Phrygian άρμονία based on the same pitch is equivalent to remaining in the Dorian arrangement of the octave and moving its starting point upwards through two tones. Thus a diagram which began all its άρμονίαι at the same pitch would satisfy the condition of saying something 'by chance' about modulation, and also fail to approach it in the way which Aristoxenus believes to be practically illuminating. His objective is to relate τόνοι and modulations to 'regions of the voice':26 that is, I think, to show how the centre of gravity of a musical passage may be shifted upwards or downwards in pitch through the device of modulation.<sup>27</sup> That of the harmonicists is merely to pack the ἀρμονίαι, for purposes

Problems 19. 32, 920 a 14–18; cf. 7, 918 a 13–18 and 47, 922 b 3–9, which display some uncertainty on the matter. But the  $\delta \rho \mu o \nu i a \iota$  to which these passages refer are evidently thought of as much older than any which are our present concern.

- The closest analogy is provided by Ptolemy's limitation of the  $\tau \acute{o}\nu o\iota$  to seven, ruling out repetition at the octave (2. 8). But his argument is evidently a new one: in the thirteen Aristoxenian  $\tau \acute{o}\nu o\iota$  the last is at an octave from the first (Cleonides 25, 4–26, 15).
  - <sup>23</sup> cf. Aristoxenus 34. 8-11.
  - <sup>24</sup> Aristoxenus 7. 10–8. 3.
  - <sup>25</sup> Cleonides loc. cit. Cf. Aristoxenus 7. 23, 37. 8–38. 5.
  - <sup>26</sup> Aristoxenus 7. 10–8. 3.
- <sup>27</sup> The importance of this for the character of the melody is emphasized at 7. 13–16. It is arguable that in this respect Aristoxenus is claiming for his  $\tau \acute{o}\nu o\iota$  some of the ethical significance earlier assigned, as Aristides Quintilianus (15. 19–20) and many others tell us, to the old  $\acute{a}\rho\mu o\nu \acute{a}\iota$ . He seems, however, to have avoided the wilder excesses of certain versions of this theory (cf. 31. 16–29).

of structural comparison, into as close a space as possible. The fact that they end up with something which relates to questions about modulation is merely an unintended by-product of their procedure; and this is precisely what Aristoxenus tells us at 7. 10–8.

Secondly, I do not think it right to insist that the series of 24 or 28 dieses be unbroken, in Macran's sense, and that a series displaying gaps where no note falls is thereby disqualified. The main passage underlying Macran's assumption is worth translating in full. 'Continuity ( $\tau \delta \sigma \nu \nu \epsilon \chi \dot{\epsilon} s$ ) is not to be sought in the way in which the harmonicists try to set it out in the katapyknoseis of the diagrams, displaying as successive with one another those notes which happen to be separated by the smallest interval. So far is the voice from being able to sing 28 dieses consecutively that it cannot even add a third diesis, but in its progress upwards sings at least the remainder of the fourth – anything less is impossible' (27, 34–28, 13). It is quite clear that here, as in some other cases, Aristoxenus is attacking his opponents on inappropriate grounds. 28 That is, he criticizes them for describing as  $\xi \xi \hat{\eta}_S \, d\lambda \lambda \hat{\eta} \lambda \omega \nu$  a series of notes each separated from the next by one diesis, on the grounds that no one could possibly sing such a series. For Aristoxenus, two notes are directly successive with one another if no legitimate note can in musical practice be placed between them. That is why he asserts that after an upwards series of two dieses the voice must sing no less than the remainder of the fourth, a ditone, since, so he argues,<sup>29</sup> there is no legitimate form of musical scale in which the interval immediately above the pair of dieses is less than that. But the tying of the notion of 'continuity' to that of a legitimate musical scale derives from a very special understanding of continuity itself, and one which there is no reason to believe that the harmonicists shared. It is wildly improbable that they thought of their 28-diesis series in this manner. They would have done so only if they thought of that series as a scale reflecting patterns of intervals employed in musical practice: and their scales, in this sense, are the seven  $\dot{\alpha} \rho \mu o \nu i \alpha \iota$ , none of which demands any such vocal gymnastics. The sequence of dieses merely represents theoretical continuity, in the sense of that series of notes between which no usable note could fall no matter what form of scale is considered legitimate. According to this conception, there simply are no notes between the points marked, and it is in this sense that the series represents  $\tau \delta \ \dot{\xi} \hat{\eta}_S$  or  $\tau \delta \ \sigma \nu \nu \epsilon \chi \dot{\epsilon}_S$ . Aristoxenus' criticism would have been better expressed by saying that their conception of continuity cannot be used for the purposes for which he wishes to use his own; and that is perfectly true.

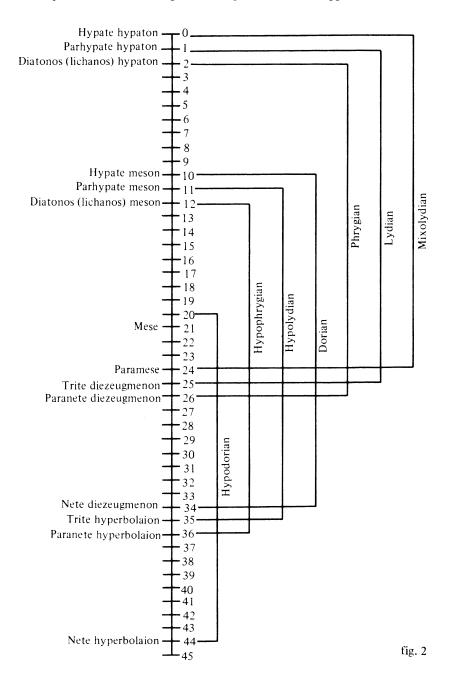
This brings us to one further point. If, as Aristoxenus tells us, their objective was

<sup>&</sup>lt;sup>28</sup> I have argued this in 'οἱ καλούμενοι ἀρμονικοί: the predecessors of Aristoxenus', Proceedings of the Cambridge Philological Society n.s. 24 (1978), 1–21, especially 15–17.
<sup>29</sup> 67. 10–25.

<sup>&</sup>lt;sup>30</sup> Plato, *Rep.* 531 a 4-b1 comments on the pursuit of the least interval. Cf. Aristotle, *Metaph.* 1016b18, 1052b20, 1083b33. Contrast Aristoxenus' implication that theoretically (not melodically) speaking there can be no least interval, 15. 7-12.

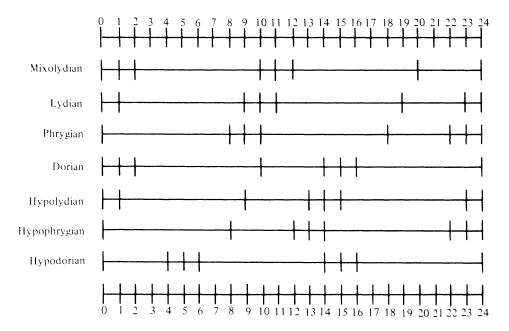
to 'compress the diagram', and if what they were dealing with were octave scales, there could have been no sensible reason for choosing a sequence of 30 dieses or 28 or 26. The only rational choice is 24, the number of dieses in the octave. I do not mean to imply that '28' at 28. 7 should be altered: as the *difficilior lectio* it should certainly be retained if possible. But let us begin with the 24-diesis diagram.

An interesting feature of Aristoxenus' forms of expression at 7. 31 and 28. 1 is their implication that the harmonicists began from something which was not the compressed diagram, but which could be turned into it. 'Wanting to compress the diagram' and 'in the compressions of their diagrams' are phrases which suggest the existence of an



uncompressed diagram upon which the process of compression was then performed. Let us suppose, then, that the treatises which Aristoxenus saw contained at least two kinds of diagram, the first uncontracted, the second compressed. If we now return to Aristides, we find that his account of what I take to be the same matter has exactly the same feature. He begins from the notion that each  $\delta \rho \mu o \nu i a$  starts from a different note – Mixolydian from hypate hypaton, Lydian from parhypate hypaton, and so on. If we represent this in diagrammatic form, mapped on to a series of consecutive dieses, we shall produce something which might look like fig. 2.

Aristides then goes on to say that the  $\pi o \iota \acute{o} \tau \eta \tau \epsilon s$  of the  $\acute{a}\rho \mu o \iota \acute{a}\iota$  will be revealed if we begin them all from the same  $\sigma \eta \mu \epsilon \hat{\iota}o \nu$ . If we take a  $\sigma \eta \mu \epsilon \hat{\iota}o \nu$  here to mean an arbitrary pitch-point designated merely as the first in a sequence, and again map the  $\acute{a}\rho \mu o \iota \acute{a}\iota$  on to a series of consecutive dieses, we shall get the following result (fig. 3):



It seems to me likely that this is at least very close to the compressed diagram to which Aristoxenus refers. But we have arrived at it by a fairly complex argument, and I do not suppose that Aristides reached his account of it by the same means, that is, by derivation from hints in the text of Aristoxenus as we now have it. He is describing something he has seen, or of which he has had a fairly direct report. It is obviously relevant that he, alone among our authorities, records an allegedly ancient quantitative system of notation which did precisely the job which the diagram demands, that of representing by a symbol each note in a quarter-tone series. I suggest that when he talks of beginning each  $\delta\rho\mu$ ovía from the same  $\sigma\eta\mu$ e $\delta$ ov, it is of the symbols in this system of notation that he is thinking.

The fact that Aristides' description fits so well with the procedure hypothetically reconstructed from Aristoxenus, and the fact that he had access to an ancient and appropriate system of notation, may give us more confidence in the value of a coincidence between one of the  $\delta\rho\mu\nu\nu'(a)$  he associates with the *Republic* and an oddity already noticed in the text of Aristoxenus. (Such confidence will of course only be justified if the source for all three of his passages is the same.) Aristoxenus, as we have seen, talks about a continuum of 28 dieses. One of Aristides' ancient divisions, that

of the Dorian, exceeds the octave by a tone, and would thus require a 28-diesis framework. This fact is alluded to by Macran,<sup>31</sup> though he fails to mention the authority on which he relies. He uses it to defend the reading '28', thereby implying that octave scales would be represented, as above, on a diagram spanning 24 dieses, and implicitly undermining his own reconstruction. But the defence itself is perfectly in order, just so long as we may reasonably suppose that the source for the divisions is the same as that for the much more highly systematized  $\delta\rho\mu\nu\nu\ell\alpha\iota$  of 15. 8 ff. and the notation presupposed by the katapyknosis diagrams.

Two considerations give this supposition a little support. One is the fact mentioned previously, that the source for the divisions cannot be Pythagorean. The terms in which they are presented are consistent with those used both by Aristoxenus himself and his successors and by the authors of the katapyknosis diagrams. The second is Aristoxenus' insistence on the 'empiricist' stance of his harmonicist predecessors. He accuses them on several occasions of attempting to 'enumerate' various phenomena, through the use of perception, and of failing to demonstrate the truth of what they assert – of failing, that is, to derive truths about  $\mu \dot{\epsilon} \lambda o_{\rm S}$  from acceptable first principles. Further, he mounts a sustained and vitriolic attack on those who think that the object of the science of ἀρμονική lies in notation, in the writing down (in a quantitative form, as his criticisms make clear) of melodies and scales.<sup>32</sup> Taken together, these remarks imply that at least one of the activities of the harmonicists was the attempt to develop a precise notation suitable for the quantitative expression of the forms of systema actually used in current musical practice. While the ἀρμονίαι of Aristides 15. 8 ff. bear obvious marks of artificial schematization, this is not true, or certainly less true, of the 'ancient divisions'. It is a reasonable inference that the schematizations began from an 'empirical' survey of the data of current musical practice, and sought to tidy it up into a systematic shape. Such a survey may be presumed to have involved writing down the data of practice in a form which made comparisons possible between them and the subsequent theoretical constructions.

When Aristides introduces the 'ancient divisions', he does not say that they are the old  $\delta\rho\mu\nu\nu'(a\iota)$ : he says that they are the divisions a ls  $\kappa a l$  o l  $\pi \delta\nu\nu$   $\pi a \lambda a l \delta\tau a \tau o l$   $\pi \rho \delta s$   $\tau \delta s$   $\delta\rho\mu\nu\nu'(as)$   $\kappa \epsilon \chi\rho\eta\nu\tau a l$  (18.5–6). I take this to mean 'which persons belonging to extreme antiquity used to represent the harmoniai', and it suggests at best a non-committal attitude to the question whether they represented them accurately. Aristoxenus, in his references to his predecessors, accuses them among other things of failing even in their perception of the phenomena. One such passage is 6.14 ff., where, speaking of Eratocles, he says

ότι δ' οὐδεὺ εἴρηκεν ἀλλὰ πάντα ψευδη καὶ τῶν φαινομένων τη αἰσθήσει διημάρτηκε, τεθεώρηται μὲν ἔμπροσθεν ὅτ' αὐτὴν καθ' αὑτὴν ἐξητάζομεν τὴν πραγματείαν ταύτην.

The backwards reference given here is not to anything in the *Harmonics* as we have it. The likelihood is that it is the same as the reference of 2. 26–30,

ὅτι δ' οὐδένα πεπραγμάτευνται τρόπον οὐδὲ περὶ αὐτῶν τούτων, ὧν ἡμμένοι τυγχάνουσι, σχεδὸν μὲν ἡμῖν γεγένηται φανερὸν ἐν τοῖς ἔμπροσθεν ὅτε ἐπεσκοποῦμεν τὰς τῶν ἁρμονικῶν δόξας.

This clearly designates a separate work, which we no longer have. Not only must it have included a fairly full account and discussion of *katapyknosis*; 6. 14 ff. makes legitimate sense only if he also argued there that certain of their representations of

<sup>&</sup>lt;sup>31</sup> Macran, op. cit. pp. 252-3.

On their failure to give demonstrations see especially 32. 27–31. For his criticism of the thesis that the aim of harmonics is notation see 39. 4–41. 24.

the phenomena, the actual data of practice, were mistaken. This carries the strong suggestion that it recorded the 'divisions which they employed' in representing those of the *systemata* in actual use which they attempted to notate.

The excellence of fit between Aristides' account of the seven octachords and Aristoxenus' remarks about *katapyknosis* is certainly too close to be coincidental. Either Aristides was equipped with a reliable independent account of the same activities which Aristoxenus mentions, or he was relying on a fuller description given by Aristoxenus himself. Aristides' authority is strengthened by his having recorded the relevant system of notation: it is worth remarking that the nature and existence of this system is nowhere used by Aristides for argumentative purposes – he merely records it and passes on, and has apparently no motive for setting it down beyond the mere fact that he had a copy in front of him. The Dorian harmonia of 18. 13-15 gives us the only plausible clue we have to why Aristoxenus apparently wrote '28' and not '24' dieses at 28. 7. If the clue points in the right direction, it indicates that Aristoxenus had seen, and taken note of, a diagram representing a scale which displayed this eccentric additional tone. Apart from the internal details of the ancient divisions and of the system of notation, there is nothing in Aristides at which Aristoxenus does not hint. The detail, however, is such that Aristides cannot have derived it directly from anything in the works of Aristoxenus which we still possess: at several points, as we have seen, it serves to answer questions which the text of Aristoxenus poses, and to explain the reference of Aristoxenus' obscure and inexplicit allusions.

It remains possible that Aristides' source is independent of Aristoxenus. It has been suggested, by Isobel Henderson for example, 33 that the source for the ancient divisions was an early commentary on the *Republic*. I have tried to give reasons, however, for thinking that the source for all three passages is the same, and it is unlikely that any such commentary would have included the information given at 12. 12 ff. and 15. 8 ff. One might also have expected such a commentary to express itself in Plato's own terminology of 'Pythagorean' ratios, not in that of the 'empiricists' whose work he dismissed with derision at Rep. 531a4-b9. If there was a single source for all three passages, it might conceivably have been a copy, or an epitome, of a work by one of the harmonicists themselves. In that case, however, one would have expected a greater difference of emphasis between Aristides' account and Aristoxenus'. It would be merely a coincidence that both accounts cover the same ground in greater or less detail, and that Aristides gives details at precisely the points where Aristoxenus' remarks become vague, and hung about with allusions to an earlier work of his own. All the salient features of Aristides' account are explained if we suppose that his source was a copy, or some later reduction, of Aristoxenus' own pamphlet On the Opinions of the Harmonicists. If this is correct, we can repose some confidence in Aristides' record of the notation of the pre-Aristoxenian theorists, and in the reconstruction of katapyknosis which I have suggested; and while my conclusion would imply that the 'ancient divisions' are indeed more or less contemporary representations of harmoniai used in Plato's day or earlier, we may retain a degree of scepticism about the accuracy with which they represented them. It is a scepticism which Aristoxenus appears to have shared.34

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<sup>33</sup> The New Oxford History of Music, vol. 1 ed. E. Wellesz (London, 1957), 349 n. 4.

<sup>&</sup>lt;sup>34</sup> This paper has not attempted to give a general account of the ancient *harmoniai* and their development. The subject is difficult and controversial. For a select bibliography see S. Michaelides, *The Music of Ancient Greece*, *An Encyclopaedia* (London, 1978), pp. 128–9.



The Principles of Greek Notation Author(s): J. Murray Barbour

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## The Principles of Greek Notation

#### By J. MURRAY BARBOUR

Many Learned tomes have been written about the music theories of the ancient Greeks. Even so, there seems to be little hope of arriving at general agreement concerning some of the finer points. Curt Sachs, who has provided in The Rise of Music in the Ancient World one of the clearest accounts of these theories, begins a chapter of his book with the sentence: "The tangle of Greek systems, scales, keys, and modes is unbelievable." And Antoine Auda, who has devoted the greater part of a work of four hundred pages (Les Gammes Musicales) to the same topic, notes in his Preface that the general confusion in this area has been compared to an "inextricable labyrinth." This is especially true of the modal scales, which would make much better sense if we could only be sure that they had the same general function as their medieval counterparts.

Concerning the interpretation of Greek notation proper, no bitter polemics are raging today. The only dispute is with regard to the general pitch level of the Greek system: whether to take the Hypolydian as the natural key, whereby the seven classic keys of Ptolemy run from none to six flats (Bellermann, Gombosi, Emmanuel, Macran, Reinach, Sachs, Westphal, et al.); or the Hypodorian, with these same keys being notated from four sharps to two flats (Auda, Gastoué, Greif, Paul, Vincent); or the Dorian, ranging from six sharps to one flat (Abert, Düring,

Riemann, Wolf). To the present author, a neophyte in such matters, the fact that the Bellermann transcriptions present the existing fragments of Greek music with fewer sharps and flats than are found in the others would be a good reason for its adoption. More compellingly, the notation itself strongly suggests that Bellermann's idea is correct.

All of the larger histories of music devote considerable space to Greek theory, including the notation. For decades a beautiful double page of Alypius' scales was displayed in Grove's Dictionary of Music and Musicians both in the original notation and the modern equivalent. (Unfortunately, like many other excellent features of earlier editions, Alypius' scales have been omitted from the fifth edition.) Even so, some modern writers have become badly confused on the subject. Perhaps the worst example is Cecil Torr, who imagined certain keys to contain intervals as small as one-eighth tone, whereas others had two sizes of quarter tones, and two keys had no interval smaller than a semitone. (Torr's contribution was to the Introductory Volume of the Oxford History of Music. Isobel Henderson's article, "Ancient Greek Music," in the New Oxford History, is excellent.) But even better informed writers have often become exasperated with what they consider the absurdities and inconsistencies of the notation system. So, what follows will be primarily an exegesis of the notation, an attempt to show that it was fundamentally logical and clear. Polemics have not been avoided completely, but have been undertaken with less zest than in the fall of 1950, when a former colleague, the late Otto Gombosi, was my friendly adversary. I believe him to have been badly mistaken in his views, but respect the profound erudition and amazing diligence with which he bolstered his thesis. (I would pay a like tribute to the memory of Curt Sachs, whom I first learned to admire in Berlin in 1930.)

Let us first examine the complete assemblage of alphabetic signs used by the Greeks, as shown by Aristides Quintilianus and Alypius. They are shown in Ex. 1, together with modern equivalents at the Bellermann pitch level. The vocal symbols are printed above the instrumental. Most of the preserved remnants of ancient Greek music are for voice, and all of these except the Delphic hymns to Apollo make use of the vocal notation. It is not strange that this exception should exist, for undoubtedly all singers could read the instrumental notation and vice versa. The fact that instrumental notation was used for instrumental interludes and punctuating notes in a vocal piece does not indicate that the two types of notation were rigidly separated. On the contrary, this gives a strong implication that the accompanist ordinarily would read the vocal notation as he played the same notes sung by the singer, the switch to instrumental notation occurring only as a warning that the singer should rest. In the few examples of purely instrumental music among the remains, the instrumental notation is used.

Rows 3 and 4 of Ex. 1 correspond to Rows 3 and 4 of Aristides' notation figures, except that the symbols are shown here in reverse order, with pitch rising from left to right. Aristides also replaced the lowest pitches, Nos. 6-1 with the high pitches, Nos. 54-49, which otherwise would not have appeared in a list of only fortyeight double symbols. In so doing he merely returned the six vocal symbols in question to a position they may have originally occupied, for these are mostly inverted letters and Row 4 is predominatingly made up of such inversions. (Mrs. Henderson comments briefly on this presumed substitution.) In other rows of his notation figures, Aristides has included all seventy pairs of symbols, their order agreeing completely with that of Alypius' scales. In these other rows, showing notation by tones and semitones, Aristides himself has followed what we consider to be the normal order of rising pitch. It is only in the complete set, which includes quartertones, that he has reversed that order—obviously to make clear that Nos. 48-25 are the usual Greek alphabet from Alpha Omega.

Row 4 of the vocal symbols contains the same letters as Row 3, many of these, such as Nos. 8, 9, 12, 13, 14, 21, and 24, being simple inversions of the letters in Row 3. But No. 23 is Beta lacking most of the lower loop: No. 22, a reversed Gamma; No. 17, the right half of Theta rotated 90°; No. 11, a skewed double-Xi; No. 10, Omicron with a short tail; No. 7, a reversed double-Sigma; No. 3, Chi with a horizontal line through it. Several of the altered letters are difficult to relate to the normal form, such as No. 4, which Alypius describes as a supine, reversed half-Phi, but which looks more like a Rho subjected to the same positional transformations; also No. 20, which, from its position in

Ex. 1	

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the table, should be a modified Epsilon, and actually is an Epsilon lacking the lowest bar. However, this modification resembles the obsolete letter Digamma and that is what Alypius calls it.

The most obvious thing about the instrumental notation is the grouping of its letters by triads. This is especially noticeable in the third row, where Nos. 28-30 show various positions (normal, supine, reversed) of Digamma, Nos. 31-33 of Sigma, and Nos. 34-36 of Kappa. Other good examples of triads are double-Šigma (Nos. 7-9), curtailed-Eta (Nos. 13-15), and Epsilon (Nos. 16-18). In No. 19, Tau is already in a recumbent position before undergoing the usual rotations; No. 40 is a reclining Lambda and No. 43 a reclining Pi. Since Eta (No. 10) is symmetrical with regard to both axes, it cannot undergo reversal or inversion. Although it might be placed in a supine position, the inventor of the notation has preferred to add a bar to it (Alypius calls it double-Pi) and to show this form inverted and normal respectively (Nos. 12 and 13). Another irregularity occurs with the positions of Gamma (No. 22), which approaches symmetry for an 135° axis. Its supine position is correct in No. 23, but for the wholly possible reversed position (see vocal symbol No. 22) an inversion of Digamma is substituted (No. 24).

What conclusions can be drawn from Ex. 1? In the first place, authorities are agreed that the instrumental notation, on the whole, is several hundred years older than the vocal notation, and that the latter is wholly dependent upon the former. The relation between the two notations can be illustrated by the modern pedal harp, which is fundamen-

tally a diatonic instrument in the key of seven flats. By a pedal, all the notes of the same letter name can be raised by a semitone to naturals, or by a tone, to sharps. The complete scale of which the harp is capable, in its manifold tunings, might be set down in this order: Cb, C, C $\sharp$ , then  $D_b$ , D,  $D\sharp$ , and so on. This, strikingly, corresponds to the Greek instrumental notation. But, to correspond to the vocal notation, these same six notes might have been called A, B, C, D, E, F—or, since the vocal notation went from high to low, U, T, S, R, Q, P. The latter designation completely destroys the significance of the functional nomenclature first given. Although the vocal notation may be safely ignored later, it will be necessary to consider it in attempting to make a breakdown of the growth of the notational system.

In the second place, it seems certain that the complete notation system of twice seventy symbols was not created in a single stage. The most striking evidence of this fact is the use of acute accents to distinguish Nos. 55-70 from the symbols for corresponding notes an octave lower. Surely this highest part of the compass came into use after the remainder of the notational system had been constructed. Next, what are we to say about Nos. 1-6 at the other end of the table? (Remember that Aristides omitted them in his compact table of forty-eight symbols.) Here the vocal symbols are modifications of those in the row above, like the remaining symbols in this row. The instrumental symbols, however, do not have the normal triadic arrangement, but are mere positional changes of the vocal symbols directly above them. (Of these six symbols, only two, Nos. 4 and 6, are used in notating any of Alypius' scales. Furthermore, No. 1 is listed as  $D\sharp$ , whereas by analogy with Nos. 22 and 43 it should be E.) This would seem to indicate that these notes also became part of the scale at a later date, being added to preserve symmetry as much as for their functional value.

A somewhat more puzzling anomaly occurs with Nos. 46-54. Here the triadic system of the instrumental notation breaks down in part. No. 46 is Nu; but its supine position is No. 49 rather than No. 47 (Alypius understandably calls No. 49 "Zeta"); its reversed position No. 52 rather than No. 48 (Alpyius calls No. 52 a derivative of Eta.) Where one might expect to find the supine and reversed positions of Nu, there occur instead an inclined straight line and its reversal (Nos. 47 and 48). Reasonably enough, Alypius names these as acute and grave accents. In place of further positions of the supine-Nu qua Zeta there are the two halves (right and left) of an Alpha split down the middle (Nos. 50 and 51), and, after the reversed Nu, the halves (left and right) of an inverted Alpha (Nos. 53 and 54). Perhaps Nos. 47 and 48 were meant originally to be the two halves of a barless Alpha, which of course would resemble a Lambda. If this assumption is correct, the three principal symbols in this group of nine are positions of Nu, and the six subordinate symbols are derivatives of Alpha.

Now, the fact that in the vocal notation the beginning of the alphabet was used for No. 48 strongly suggests that when the vocal notation was invented this was the top of the musical compass. However, with the pitch assigned to No. 48 in the complete series, this supposition

is not sound, for a scale would probably not end with subordinate notes such as Nos. 47 and 48. This fact is illustrated by the highest note in the complete set, No. 70, standing all by itself in the top row—which is most annoying to anyone who desires symmetry. But No. 70 was needed, of course, as the highest note of the highest key, the Hyperlydian.

It is a not unlikely hypothesis that originally the instrumental notation ended with No. 48, and that then the rotations of Nu now located as Nos. 49 and 52 occupied the places of the present Nos. 47 and 48. But they would have already had their present pitches, making this triad quite unlike all those which preceded it in the scale. Later, to the complete set of instrumental symbols of which these were the highest, the ordinary Greek alphabet and its modifications were added to form the vocal notation. The highest pitches in this hypothetical scheme (see Ex. 2) would have been sufficient to notate the upper octave of the natural Hypolydian key (A minor), as well as the next lower principal keys, the Hypophrygian (G minor) and Hypodorian (F minor).

Ex. 2									
46	47	48							
Γ	В	Α							
N	Z	И							
f	g	a							

To continue with the hypothesis stated above: when it was found desirable to extend the scale upward, there was no question about the vocal notation—it had to remain rigidly symmetric, and so Nos. 47 and 48 took on their present significance, and variants of Nos. 25-30 were used for Nos. 49-54. For some reason, the

instrumental notation for g' and a' was retained, and new symbols were hastily developed from the letter Alpha to notate the pitches dependent on f', g', and a'.

It is interesting to compare all these hypothetical results with the chronological list of scales given by Gombosi. If the instrumental notation arose soon after 400 B.C., as some scholars believe, we might expect it to be capable of notating all the scales in use at that time. Their meses are

$$g, a, bb, b, c', c\sharp', d', eb, e', f'.$$

Of these scales, the Hypophrygian (g), the Hyperiastian (e'), and the Hyperphrygian (f') were the most recent, having been added by Timotheus in 400 B.C. If the Hypophrygian is removed from the above list, an excellent result is obtained, for now the lowest scale is the natural key, the Hypolydian (a). At the upper end of the compass, the results are not so encouraging, for if the Hyperiastian and Hyperphrygian are retained, the highest pitches needed would be Nos. 43 (e') and 46 (f'), and if the Mixolydian (Hyperdorian) is taken as the highest key, no note higher than No. 42  $(d\sharp')$  would be needed. But No. 48 must at one time have been the top of the scale. So it seems as if the notation had been devised for the Greater Perfect System, A-a', and the various genera of the natural Hypolydian key would have been notated admirably under the hypothesis previously stated, namely, that the two highest notes in the scale had been whole tones above f', thus:

According to this hypothesis, only the Hypolydian would originally have appeared in a complete two-octave form, and it would have been immaterial if the keys having their mese on e' and f' had been a part of the system or not, for the compass was large enough to include an octave of each.

The addition of Nos. 49-54 does not represent an increase in the number of scales, but an extension to the Lesser Perfect System for all the scales then in use, now definitely including the Hyperiastian and Hyperlydian. If the Hypophrygian was added at the other end of the compass at the same time as these highpitched scales, this necessitated the addition of one symbol only, No. 7, for its proslambanomenos. It is intriguing that double-Sigma, logically appearing in the vocal notation as No. 7, was also chosen for the instrumental triad, Nos. 7-9. However, No. 22 is Gamma in both notations and No. 31 is Sigma in both. Since the latter two notes seem to have been notated with the same letter by chance, we cannot be sure that the double-Sigma found in the two notations was used by design.

By the time of Aristoxenus, the Hypodorian (f) was added at the lower end of the compass, and also two subordinate keys to fill in gaps—the Hypoiastian (f#) and the Hypoaeolian (g#). It is obvious that the addition of the six lowest symbols, of which Nos. 4 and 6 were needed as the proslambanomenoi of the two new keys, must have taken place long after the main part of the notation was completed, both instrumental and vocal.

The symmetrical set of fifteen keys which Alypius describes was completed by the addition of the Hyperaeolian  $(f\sharp')$  and Hyperlydian

(g'). The notation through No. 70 is sufficient to give two complete octaves of all fifteen scales. It is at least possible that the supernumerary symbols, Nos. 55-70, were added to the notation at the time the two new scales were included in the set. Gombosi mentions one more low key, the Deep Hypodorian (e), for which Nos. 3, 4, 5, and 6 were needed. Although he describes it as Ptolemaic, it was not part of Alypius' scheme, the symmetry of which would have been spoiled by its presence.

The foundation of the instrumental notation was a diatonic scale in the Hypolydian key, using only the normal position of the letter symstated, Nos. 49 and 52 were not a part of the original diatonic scale shown in Ex. 4, which thus could not have extended to two full octaves. The notes in question would not have been added until after the system of triads had been devised. The latter may have been constructed in two main stages, adding only the reversed letters at first, to indicate the rise of a semitone. Such a scale of semitones would have been sufficient to notate the diatonic scales in Ptolemy's classic keys. It would have served also for the ancient transilient type of enharmonic (the scale of Olympus), a variety of pentatonic scale, but with semitones, unlike the modern black-key scale. Ex. 5 shows

Ex. 4

bols, as shown in Ex. 4. If objection is made that No. 19 seems to be a supine Theta, it should be pointed out that many scholars think that these letters come from an archaic alphabet in which nearly half of the characters have a meaning different from the classical letters which they resemble. Gombosi, after Westphal and Gevaert, gives these names for the symbols in Ex. 4, from left to right: Eta, Iota, Epsilon, Lambda, Gamma, Mu, Digamma, Theta, Kappa, Delta, Lambda, Beta, Nu, Zeta, Alpha. Six of the fifteen symbols (Nos. 13, 19, 31, 37, 43, and 52) thus changed their meaning in the course of time.

In a previous paragraph something was said about the puzzling character of the group of instrumental symbols, Nos. 49-54. If there is any validity in the hypothesis there

the Hypolydian key in the diatonic, the older enharmonic, and the later enharmonic genera.

Ex. 5

 Diatonic
 A B C D E F G A

 Older Enharmonic
 A B C E F A

 Later Enharmonic
 A B B C E E F A

As notated with the reversed letters, natural notes are altered only upward, as we use sharps. And yet, paradoxically, in the seven classic keys all of these altered notes have the function of our flats! Let us examine in Ex. 6 what the original notation of these seven keys probably was, expressed in terms of our own notation. The arrangement around the circle of fifths will make certain relationships clearer. The fourth and seventh note in each scale would have been omitted in the

transilient type of enharmonic described above.

#### Ex. 6

It will be observed that, except for the upper tetrachord of the Mixolydian key  $(A \sharp B C \sharp D \sharp)$ , the second note of each tetrachord (the bottom note of the octave scale shown, the proslambanomenos, is not considered part of a tetrachord) is notated as the sharp of the first note. This is true even of the lower tetrachord of the Lydian key and of both tetrachords of the Hypolydian, although primitive notes, C and F, might have been used for the equivalent B # and E #. Obviously, the notation was chosen to indicate the function of these notes—the intimate relationship between the two notes a semitone apart. Today the leading note of C# minor is always notated as B # and that of F # minor as E #. We should not suppose the Greeks to have been any less sensitive to scale relationships than we are.

The notation of Ex. 6 is an attempted reconstruction of a possible early stage of Greek notation. But by the time that the instrumental notation was fixed in the form in which we know it, the enharmonic genus had taken on its heptatonic form, as shown in Ex. 5. A quartertone now being present between notes a semitone apart, it was necessary to devise a symbol for its notation, and this was easily done by putting the letter in a supine position. There was no attempt to make a complete scale of quartertones, al-

though this could have been done by turning the letter to a prone position, thus:

Ex. 7

(m) E w 3

With a scale of quartertones, there would not have been the anomalous notation of the enharmonic genus found in the five subordinate keys, a phenomenon to be examined later. Schäfke shows a purportedly ancient notation with twenty-four quartertones in the lower octave, and twelve semitones in the higher octave. In this notation each vocal-instrumental pair represents rotations of the same letter, similar to Nos. 1-6 of Ex. 1. This fact alone would make one judge it to be very late rather than very early. Moreover, the doctrine of the division of the octave into twenty-four equal dieses is Aristoxenian, which is definitely later than the heptatonic scale which underlies the Aristides-Alypian notation. In any case, the Schäfke diesis table is unique.

In Ex. 8 there is the modern equivalent of the later type of enharmonic

Ex. 8

		#		#				
Hypolydian	$\boldsymbol{A}$	B B	B # E	$\ddot{E}$	E # A			
		#		#				
Lydian	D	E E	$E \sharp A$	$\boldsymbol{A}$	A # D			
		#		Ħ				
Hypophrydian	$\boldsymbol{G}$	A A	$A \sharp D$	D	D # G			
		#		#				
Phrygian	$\boldsymbol{\mathcal{C}}$	DD	D # G	$\boldsymbol{G}$	G# C			
		#		#				
Hypodorian	$\boldsymbol{F}$	G	G# <b>C</b>	$\boldsymbol{\mathcal{C}}$	C # F			
		#		Ħ				
Dorian	$A \sharp$	C	C# F	F	F# A#			
	-	#		#				
Mixolydian	$D \sharp$	FF	F# A‡	B	B# D#			
genus for th	e s	even	classic	: k	evs. In			
six and a h	alf	of	these	scal	es the			
six and a half of these scales the notation is wholly regular. But the								
upper tetrac	пог	a or	the iv	11X(	nyalan			

key, which had shown an irregularity in the hypothetical diatonic notation of Ex. 6, is again an exception, with a chromatic  $(A \sharp B B \sharp D \sharp)$ 

rather than in enharmonic ( $A \sharp A \sharp B D \sharp$ ) progression. Of course, as was pointed out in the preceding paragraph, the Greeks missed an opportunity by failing to provide for such

a note as  $A^{\sharp}$  for which an instrumental symbol might easily have been devised. We shall return later to the anomalously notated upper tetrachord of the Mixolydian.

Ex. 9

			#			#		
Hypolydian	$\boldsymbol{A}$	В	$\ddot{B}$	D	$\boldsymbol{E}$	Ë	G	$\boldsymbol{A}$
			#			#		
Lydian	D	E	$\boldsymbol{E}$	$\boldsymbol{G}$	$\boldsymbol{A}$	$\boldsymbol{A}$	C	D
			#			#		
Hypophrygian	$\boldsymbol{G}$	A	$\boldsymbol{A}$	C	$\boldsymbol{D}$	D	F	$\boldsymbol{G}$
			#			Ħ		
Phrygian	C	D	D	F	G	G	$A \sharp$	C
			#			#		
Hypodorian	F	G	$\boldsymbol{G}$	$A \sharp$	C	С	D#	$\boldsymbol{F}$
			#			#		
Dorian	$A \sharp$	C	$\boldsymbol{\mathcal{C}}$	$D \sharp$	F	F	$G^{\sharp}$	$A \sharp$
			#					
Mixolydian	$D \sharp$	F	F	$G \sharp$	$A \sharp$	$\boldsymbol{\mathit{B}}$	<i>C</i> #	$D \sharp$

Let us now examine the actual instrumental notation of the classic keys in the diatonic genus, as shown in Ex. 9.

It differed in one important detail from that shown in Ex. 6: the third and sixth notes in the scale were notated only a quartertone higher than the second and fifth notes, instead of a semitone higher as in the hypothetical notation scheme of Ex. 6. An attempt will be made later to explain this anomaly.

The chromatic genus in the classic keys was notated the same as the enharmonic, save that the highest note in the pycnon had a diagonal stroke—a bar sinister—through it to distinguish it from the corresponding note of the enharmonic genus, a semitone lower. (The exact position of the stroke is largely conjectural, since Alypius showed the chromatic strokes for the Lydian key only.) As an example, Ex. 10 contains the instrumental notation of the Hypolydian key in all three genera.

#### Ex. 11

 Hypoaeolian
 G# A# B C# D# E F# G#

 Aeolian
 C# D# E F# G# A B C#

 Hypoionian
 F# G# A B C# D E F# G A B

 Ionian
 B C# D E F# G A B

 Hyperionian
 E F# G A B B D E

The notation of the diatonic genus of the five subordinate keys is shown in Ex. 11. Here the notation is perfectly regular, corresponding with

Ex. 10	•														
Enharmonic	Н	h	-	Ч	Γ	L	Ł	C	K	¥	K	L	<u>ا</u>	J	И
	A	В	B	$B^{\sharp}$	e	e	e#	a	Þ	<b>#</b>	<b>Б</b> #	e'	ë'	e#	a'
												_	te.	_	
Chromatic	Н	h	工	A	Γ	L	E	С	K	*~	K	L	1	7	И
	A	В	B	c#	е	ŧ	f#	а	Ь	* <u>*</u>	c#/	e'	¢'	$f^{\#'}$	a'
	н	<b>h</b>	_	<b>_</b>	_	ţ.	F	_	K	<b>×</b>	_	٢	. 1	7	и
Diatonic	••	• • •	#	•	•	*	•			#		_	<u></u>	-	••
	A	В	B	d	e	ė	g	a	Ь	# b	ď	e'	r 1	g'	a <sup>'</sup>

Ex. 1, until the upper tetrachord of the Hyperionian key is reached. The latter has the curious quartertone rise

from B to B as in the classic, keys in Ex. 9, which follow this key in a circle of fifths. Similarly, the upper tetrachord of the Mixolydian key in Ex. 9 had followed the pattern of the subordinate keys in Ex. 11, which come after it in the circle. The pattern thus becomes clear: the notation was devised for the tetrachord, rather than for the octave scale.

In Ex. 12 is shown the enharmonic notation of the subordinate keys. Actually, save for the upper tetrachord of the Hyperionian, it turns

Ex. 12

HypoaeolianG# A# B B# D# E E# G#AeolianC# D# E E# G# A A# C#HypoionianF# G# A A# C# D D# F#IonianB C# D D# F# G G# B

Hyperionian E F # G G # B B # E

out not to be enharmonic at all, but chromatic! The notation shown is perfect for the chromatic genus of the first four keys in Ex. 11 and of the lower tetrachord of the Hyperionian as well. We are told that the notation was used in precisely the same form for the enharmonic genus, but with the intervals forming the pycnon contracted to a semitone instead of a tone; for example, in the

Hypoaeolian key— $A \sharp B B \sharp D \sharp$  for

the chromatic, A # A # B D # for the enharmonic. (Compare what has been said about Ex. 8.) This seems very unlikely, and it is known that the enharmonic genus had fallen out of favor by the time the subordinate keys were in vogue. As an example of the notation of the subordinate keys, Ex. 13 gives the Greek instrumental notation of the Hypoaeolian key for the chromatic-enharmonic and the diatonic genera.

Since the tetrachord is the real unit of the Greek notation system, very simple rules can be given for notation in the various genera, without reference to keys as such. The criterion is whether the lowest note in a tetrachord is a note in the primitive Hypolydian key of Ex. 4, i.e., a natural note in the modern transcription in Ex. 1. If this is the case, the next highest note in the diatonic genus uses the supine position of this same letter; the third and fourth notes will be notated as in Ex. 1. For the enharmonic genus, the next-tothe-bottom note will use the supine position, and the third note the reversed position; the top note will be the same, of course, in all genera. The chromatic genus is notated the same as the enharmonic, with the exception that the reversed position of the letter will have the bar sinister to indicate that it is a semitone

Ex. 13

Chromatic (Enharmonic)	3	A										>			
	G <sup>#</sup>	A <sup>#</sup>	В	₿#	d <sup>#</sup>	e	e#	9#	a#	Ь	6#	ď*′	e <sup>l</sup>	e#1	9#1
Diatonic	3 <i>G</i> <sup>#</sup>	A#	h B	∃ c <sup>#</sup>	<b>-</b> †	Г e	¬ f <sup>‡</sup>	7 9 <sup>#</sup>	⊃ a <sup>‡</sup>	К <i>Ь</i>	λ c#′	> d#	L e'	f#1	^ g#1

higher than the corresponding enharmonic note.

If the lowest note of a tetrachord is non-primitive (i.e., a reversed letter, interpreted as a sharped note in Ex. 1), the next higher diatonic note will necessarily be a primitive note and the third and fourth notes will be notated as in Ex. 1. For the chromatic genus, the second note will similarly be a primitive note and the third note will be the reversed position of this letter. The enharmonic, if used, was notated exactly the same as the chromatic.

These rules can be put in tabular form, as shown in Ex. 14.

simple rules with those given in some of the well-known books and articles on Greek music, where many apparently exceptional usages have to be explained unnecessarily.

Please observe that, although some writers have maintained the opposite, Greek notation made no provision for commatic distinctions—slight pitch nuances between pairs of notes which we should call enharmonically equivalent. For example, No. 33 represents  $B_b$  in the Hypodorian and Phrygian keys and  $A_b^{\ddagger}$  in the Hypoaeolian, Dorian, and Mixolydian; No. 42 represents  $E_b$  in the Hypodorian and  $D_b^{\ddagger}$  in four other

Ex. 14

Enharmonic (Chromatic)	Lowest Primitive E c	2nd Supine LJ \$	3rd Reversed ヨ(生) c‡(d)	Highest  - N f
Diatonic	Primitive E c	Supine LLI # C	— —I d#	
Chromatic (Enharmonic)	Non-Primitive 3 c#	Primitive — d(d)	Reversed —I d <sup>#</sup> (d)	— Ч f#
Diatonic	Non-Primitive 3 c#	Primitive 	— Г е	— Ч f#

Where dashes occur for the third and highest notes of a tetrachord, this means that these notes are notated according to Ex. 1. Actually, if the lowest note is non-primitive, all the notes in the tetrachord will be notated according to Ex. 1. It is interesting to contrast these very

keys. We consider such enharmonic equivalence a sign of equal temperament—a conclusion confirmed by Aristoxenus' divisions of the tetrachord. On the other hand, homotones, supposed unisons, were notated differently in "white" tetrachords when they had a specific

Ex. 15

			#				#			
Enharmonic	A	$\boldsymbol{\mathit{B}}$	$\boldsymbol{\mathit{B}}$	i	B#	$\boldsymbol{E}$	$\boldsymbol{E}$		E#	$\boldsymbol{A}$
Ratios		9/8	28/27	36/35	5/4		28/27	36/35	5/4	
Cents	0	204	267	3	16	702	765		814	1200
			#				#			
Chromatic	$\boldsymbol{A}$	$\boldsymbol{\mathit{B}}$	$\boldsymbol{\mathit{B}}$	(	C#	$\boldsymbol{E}$	$\boldsymbol{E}$		$F \sharp$	$\boldsymbol{A}$
Ratios		9/8	28/27	243/224	32/2	7	28/27	243/224	32/2	7
Cents	0	204	. 267	4	μο8	702	765		906	1200
			#				#			
Diatonic	$\boldsymbol{A}$	$\boldsymbol{\mathit{B}}$	$\boldsymbol{\mathit{B}}$		D	$\boldsymbol{E}$	$\boldsymbol{E}$		$\boldsymbol{G}$	$\boldsymbol{A}$
Ratios		9/8	28/27	8/7	9/8		28/27	8/7	9/8	
Cents	0	204	. 267	' 4	<b>μ98</b>	702	765		996	1200

function, such as the enharmonically lowered F's (No. 44) of the Hypoaeolian and Lydian compared to the regular F's (No. 45) of the Hypodorian, Hypophrygian, and Phrygian.

We had promised to attempt an explanation of the puzzling quartertone rise for all three genera from the lowest to the second note of tetrachords which begin with a primitive note. (See Ex. 14.) Various explanations of this phenomenon have been given, of which a recent account will be presented and discussed later. The hypothesis which appeals to me makes reference to the tuning systems of Archytas, friend of Plato. This connection between Archytas' tunings and the instrumental notation was first suggested by Westphal, and his conclusions were later approved by authorities such as Gevaert, Sokolowsky, Reinach, and Winnington-Ingram. Other writers have casually or pointedly ignored Westphal's theory, but nowhere have I seen an attempt to refute it. Except for the systems of Aristoxenus, the most unusual of all those listed by Claudius Ptolemy were the tunings of Archytas. They were unusual in having the same interval at the bottom of each tetrachord, rather than a semitone for the diatonic and chromatic genera and

a quartertone for the enharmonic.

In Ex. 15 are given the ratios, cents values, and equivalent modern notation for the Hypolydian key for Archytas' tunings in the three genera. The interval common to the three genera in Archytas' system was not a quartertone; with the ratio, 28/27, it contained 63 cents and so was approximately a third-tone. The third-tone appears again in two of Aristoxenus' mixed species. His Soft Chromatic plus Tightly Stretched Diatonic had 1/3, 7/6, and 1 tone in each tetrachord. Assuming a tone of 200 cents, this would be 67, 233, and 200 cents. This matches Archytas' diatonic, with its 63, 231, and 204 cents. Similarly, Archytas' chromatic tetrachord is practically the same as Aristoxenus' Soft plus Tonic Chromatic, which had 1/3, 2/3, and 3/2 tones; or 67, 133, 300 cents. For Archytas, read 63, 141, and 294 cents.

Ptolemy has repeated Archytas' diatonic ratios for his own Diatonon Toniaion. It is significant also that of the five mixed tunings listed by Ptolemy as in practical use, the Archytas diatonic was always present as either the higher or lower tetrachord. So the Archytas tunings had considerable validity in the post-Pythagorean period. (Note that his Diatonic and Enharmonic were con-

structed with nothing but superparticular ratios, Ptolemy's touchstone of a satisfactory tuning.) If, as some authorities believe, the Greek instrumental notation was invented by Archytas, the use of the supine position of the letter to indicate the rise of the third-tone in each genus is wholly logical. An interesting corollary is that the reversed position of the letter might have been used for the Pythagorean semitone, although there is no direct evidence on this point.

The original meaning of the supine and reversed letters of the instrumental notation was conceived very differently by Curt Sachs. His first premise was that the notation was based on the playing of a stringed instrument of the lyre type. Although this does not seem unreasonable, Greif and other scholars in this field believe that the aulos determined the notation. Secondly, he maintains that the normal, supine, and reversed positions of the same letter can mean only an open string and two grades of stopping. With this statement there has been far more disagreement. From his tremendous storehouse of information, Sachs cites many examples, both ancient and modern, of plucked instruments like the lyre and harp, instruments without a fingerboard, but upon which some degree of stopping was done. He thinks that the Greeks pulled the string aside by a finger of the hand that was not engaged in plucking the string. This had the advantage that tension could be applied with relative ease. It had the disadvantage that a finger is too soft to make a satisfactory bridge for a plucked string—the reason why the fretted guitar gives a better "plunk" than the pizzicato of a violin. (It would be more like a stopped note on the horn.) Of course, the finger might have been covered with metal, or the player might have held a plectrum against the string.

Gombosi, indeed, believes that the stopping was done with a plectrum. He shows the painting of a kithara player from an amphora in the Museum of Fine Arts in Boston, in which the plectrum appears to be held against one of the strings, between the bridge and the point of attachment of the string. It would be fantastically difficult to apply the required tension at this point with the pointed end of a plectrum, but the quality of the string would not be affected adversely, as it is when the finger is applied above the bridge. Gombosi adduces the example of Japanese koto playing, in which higher pitches are produced by added tension below the bridge. But the koto, a monochord-like instrument, lies on the floor in front of the player, so that it is relatively easy for the player's finger to increase the tension.

If we assume for the moment that Gombosi's notion of the stopping might have been feasible, let us consider the problem of producing on a single string all of the pitches that Sachs's theory demands. For the enharmonic genus, a quartertone above the open string is needed; for all three genera, a semitone; for the chromatic, a tone—and also for the diatonic if we accept another part of Sachs's theory to be discussed later. That is, three different stopped pitches on one string. For an instrument with a fingerboard, this would not be difficult, since the same relative positions would be stopped on each string.

The strings of the lyre were all approximately the same length. Then the variations of pitch (simple

enough for strings of different lengths) would have to be made by varying the diameter of the strings or by varying their tension or both. Probably the lower-pitched strings were somewhat thicker. But it is not even practicable today, with all our scientific advances, to make the variation of pitch from one string to another on the violin solely by varying the thickness of the strings: the tension on the E string is approximately twenty-two pounds, but on

player's finger about half a pound; for the B string about a pound; and for the octave E nearly two pounds. The added tension necessary for a semitone would be one pound for the E string; over two pounds for the B string; and four pounds for the octave E. For a tone, two pounds must be added on the E string, four and a half on the B, and eight on the octave E. And of course there are other variables for the other strings, as shown in Ex. 16.

Ex. 16

	$oldsymbol{E}$	${m F}$	$\boldsymbol{G}$
Open	8	9	II
Quarter	8.5	9.5	11.7
Half	9.0	10.I	12.4
Whole	IO.I	II.4	13.9

the G string only ten pounds. So on the lyre there must have been considerable variation of tension.

Now, frequency varies directly as the square root of the tension. This means, other things being equal, that if two strings were to sound an octave, the higher would have four times the tension of the lower. The ratio of the perfect fifth being 3:2, its tension would be 3/2 squared or 9/4—slightly more than twice. And so with all of the other strings. This would in itself be of little concern to the player, for in tuning he would vary the tension until the proper pitch was produced.

But, when it came to producing the stopped notes, without a finger-board, his muscles would have had to be as sensitive as those of a diamond-splitter. Suppose the tension on the lowest string (call it E) is eight pounds; then it would be 32 pounds for the E an octave higher; and the fifth, B, would have 18 pounds' tension. To produce a quartertone on the E string, the tension would have to be increased by the

$\boldsymbol{A}$	$\boldsymbol{\mathit{B}}$	С	$\boldsymbol{D}$	$\boldsymbol{E}$
14	18	20	25	32
14.9	19.1	21.2	26.6	33.9
15.8	20.3	22.5	<b>28.</b> I	26.0
17.5	22.7	25.3	31.6	40.4

These above variations are undoubtedly too large, since the strings probably did not all have the same diameter. That is immaterial; the important thing is that there would have been considerable variations, in any case, and the player would have to have them all literally at his fingertips. And then, suppose one of the strings is brand-new—ask a violinist what that does to the tension. Or suppose it is a rainy day, what happens then? (After having heard me propound this question in a paper at Washington, Dr. Kinkeldey wrote that this latter hazard might be disregarded, since damp weather is a rarity in Greece.)

Otto Gombosi once said to me that all this does not really matter: the Greeks were satisfied when they had produced four different pitches on a string; they did not much care if the pitches were too sharp or too flat, or if they did not correspond to those produced on another string. But that would make a travesty of all the subtle tunings handed down to us by the Greeks: Ptolemy's

five different diatonics; Aristoxenus' three chromatics, containing respectively third-tones, three-eighth-tones, and semitones, and all the other refinements, including the mixed species. They must have taken the pains to set up these tunings on the monochord, and from there to transfer them to their instruments. They must have had ears keen enough to enjoy these delicate shadings, and to be annoyed when errors were made. I cannot believe that such sophisticates would have endured the cacophony inherent in the stopped strings of the lyre.

The more radical part of Sach's theory was that the notation was intended for an instrument with only five strings to the octave, that is, for a scale that was fundamentally pentatonic. (In addition to Gombosi, Sachs's hypothesis is supported by Abert, Vetter, and Düring.) From this view I sharply dissent. Of course, since all accidentals were treated as sharps in Greek notation, the diatonic genus of the seven classic keys (natural through six flats) was generally notated with only five letters in the octave, including the Hypolydian, with its functionally notated B and E, and the Lydian, with its

 $\tilde{E}$ . (See Ex. 9.) So Sachs contends that the tuning of the lyre included either a B or a C and either an E or an F, but never both notes of a pair at once.

Gombosi has developed this idea of Sachs much further, making the high or low tuning, F or E tuning, the central theme of his book. From the Hypophrygian through the Dorian, two through five flats, each key contains both  $E_b$  and  $B_b$ , and so would not contain either E or B. For these four keys, Gombosi pre-

scribes for the lyre the pentatonic tuning, A C D F G. But the Mixoly-dian, six flats or six sharps, is another story. As shown in Ex. 9, it is notated with six different letters— $D\sharp$ ,

F, F,  $G\sharp$ ,  $A\sharp$ , B,  $C\sharp$ ,  $D\sharp$ . But Gombosi explains that the pitch notated as  $C\sharp$  must have been B, because there could not have been both a B and a C string!

Proceeding around the circle of fifths, the subordinate keys run from five sharps through one sharp. According to Gombosi, these used a common tuning, A B D E G. But in four of these five keys, the Hyperaeolian through the Iastian, where seven different letters are used in the octave, both  $C\sharp$  and  $F\sharp$  belong to the diatonic scale and are correctly notated. (See Ex. 11.) In his obsession with pentatonicity, Gombosi insists that these notes were performed as if notated  $B \times and E \times respec$ tively. (Both  $B \times and E \times occur in$ the chromatic genus of the Hypolydian key, where they were notated with such symbols as No. 15 and No. 24; in the diatonic genus of the sharp keys to which reference has just been made,  $C\sharp$  and  $F\sharp$  were notated with symbols three steps higher than these, such as No. 18 and No. 27.) The key of E minor, Hyperiastian, being, like the Mixolydian, a border key, has one note,  $F\sharp$ , for which Gombosi claims an equivalent performance as  $E \times .$ 

Further difficulties occur for Gombosi in the conjunct (synemmenon) tetrachord of four of the five classic keys. This lowering of the second note of the tetrachord, like the medieval *B rotundum*, was like adding a flat to the signature or subtracting a sharp from it. So in the conjunct tetrachord of the Dorian key,  $B_b$  minor, the note  $C_b$  occurs,

notated as No. 34, a primitive note; to Gombosi, however, it had to be performed as  $A \times$ , since he holds that there was no B string in this key. Again, in the Mixolydian, the synemmenon E (No. 43) was to be performed as  $D \times$ . Further synemmenon examples were the Hypolydian, where No. 37 is to be taken as  $B \ddagger$ , although it plainly conveys C, and the Lydian, where No. 46 is twisted to mean  $E \ddagger$  instead of F.

This makes a total of fourteen notes that Gombosi said were not performed in accordance with the definitely expressed notation, but in an enharmonically equivalent manner—one for the classic keys (Mixolydian), nine for the subordinate keys, and four for the synemmenon tetrachord of the classic keys. (Winnington-Ingram also calls attention to the above absurdities.) But surely any theory is false which must be bolstered by all sorts of exceptions to meet cases which are wholly regular according to a different set of rules. There is really no proof whatever that the notation was based upon a five-string lyre. It would have been possible to notate all fifteen scales with a total of five letters in the octave (each in three positions, of course) or even with four, for that matter. But the actual notation is for a scale with seven notes in the octave.

Although Gombosi shows that there were plenty of lyres with at least seven strings by the time that the instrumental notation was probably perfected, perhaps this notation was never intended for a particular instrument. Perhaps it was an abstraction, intended at first to convey clearly the structure of the principal keys, in which as Maurice Emmanuel believes, the two higher notes of the chromatic or enharmonic pyc-

non served as a double downwardresolving leading note to the lowest note of the tetrachord, and in which the diatonic semitones were likewise thought of as resolving downward, as in the cadential F-E of the medieval Phrygian mode. Then, when the subordinate keys came into use, the notation was forced to serve them also—clear and practical now, but without the subtlety with which it began. This is the commonsense view, the simple explanation. Why attempt to wrestle with the overwhelming challenge that is inherent in the hypothesis of the stopped string of the pentatonically tuned lyre?

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An Annotated Translation of Euclid's "Division of a Monochord"
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# AN ANNOTATED TRANSLATION OF

The so-called Greater Perfect System of ancient Greek music theory has long attracted the attention of scholars attempting to comprehend the arcane and abstruse theoretical basis of ancient Greek music. Indeed, even modern music appreciation texts and general histories frequently include as a matter of course an illustration of the Greater Perfect System or the Perfect Immutable System as a demonstration of the relationship between the various tetrachords and notes of the ancient Greek scale systems. The Greater Perfect System is regarded as the keystone of ancient Greek theory, yet the formulation of the system by antique writers and its significance is no longer clearly understood.

The earliest known systematic explanation of the Greater

# EUCLID'S DIVISION OF A MONOCHORD

### THOMAS J. MATHIESEN

Perfect System is that found in a short work now generally entitled in English works either Division of a Monochord or Sectio canonis, probably written around 300 B.C. by Euclid.<sup>1</sup> The treatment begins with a brief section proposing certain acoustical axioms, continues with a series of purely mathematical propositions, follows this with a series of corollaries relating to notes within the Greater Perfect System, and concludes with two propositions—or rather, demonstrations—that provide a means of finding all<sup>2</sup> the notes of the Greater Perfect System on the monochord. The treatise was regarded by at least one ancient writer, Porphyrios, as important enough to quote at length.<sup>3</sup>

Despite the importance of this work, it does not seem to

have been carefully examined by modern writers, and I am not aware of any current translations. The most recent translation—into Latin—is that of Henricus Menge published in 1916,<sup>4</sup> and the only English translation—not too readily available and incomplete—is that of Charles Davy published in 1787.<sup>5</sup> Furthermore, the text and translation of 1916 largely follows the questionable emendations proposed by Karl von Jan in his Teubner text of 1895<sup>6</sup> and even contains a crucial misprint.<sup>7</sup> Clearly, a new translation based on a critical reading of the text and supplied with annotations is needed.<sup>8</sup>

#### The Text

Seven of the manuscripts containing Enclid's *Division* have been thoroughly collated by Jan and Menge, and detailed descriptions may be found in their publications. For the purposes of this translation, Menge's Teubner text was substantially followed, though compared line-by-line with Jan's and with Düring's text of Porphyrios, where the first sixteen propositions are quoted. In addition, I have collated the readings of Euclid's text as it appears in the following codices: Bononiensis gr. 2048,1, fol. 135r-139r; and Londinensis Musei Britannici add. 27863, fol. 114v-121v. There are several places in the text where Menge has allowed earlier emendations to remain, or has emended the text himself, or has overlooked a misprint. In these places, I have read the text differently, following the best manuscript and eliminating the editorial change or error. All changes and departures from Menge's text are noted in the references to the translation.

#### The Annotations

Euclid's treatise is, on the whole, quite lucid and not in need of abundant annotation. There are some places where clarification or correlation seems helpful, and I have accordingly added it at those spots. Additional passages from Porphyrios have been added here and there for the sake of clarification or comparison. Manuscript sigla used in the annotations follow those assigned and described by Menge.

#### DIVISION OF A MONOCHORD

If there should be rest and absence of motion, there would be silence. If there is silence and nothing moves, nothing

would be heard. If, therefore, anything is to be heard, it is necessary that there first be pulsation and motion. So, since all notes arise from some existing pulsation, and pulsation is impossible unless first arising from motion-and, of motions, there are the more frequent and the intermittent; and the more frequent make higher notes, the intermittent, lower [notes]—it is necessary that there be on the one hand higher [notes] since they are compounded of more frequent and abundant motions, and on the other hand lower [notes], since they are compounded of intermittent and fewer motions. So, those higher than proper are loosened<sup>10</sup> by subtracting motion and reach the proper point, and those lower are tightened by adding motion and reach the proper point. Therefore, it is necessary to say that notes are compounded of parts, since by addition and subtraction they reach the proper point. For as all things compounded from parts are ordered one to another in numerical proportion, so also is it necessary that notes be ordered one to another in numerical proportion.<sup>11</sup> For as with numbers there are some which are ordered in multiple ratios and others in superparticular and others in superpartient, so also is it necessary that notes be ordered one to another in such ratios. Of these, the multiple and the superparticular are ordered one to another by one term.<sup>12</sup>

So we also recognize concerning notes that some are consonant and some are dissonant; and that [two] consonant [notes] make a single blend, 13 and dissonant [notes] do not. As this is the case, it is reasonable that [two] consonant notes, since they both are made into a single blend of sound, are—when ordered numerically one to another by one term—either multiple or superparticular.

1

If a multiple interval<sup>14</sup> doubled makes some interval, this [interval] will also be multiple.

Let there be interval BC<sup>15</sup> and let B be a multiple of C; and let it be that as C is to B, so B is to D. I say surely that D is a multiple of C. For since B is a multiple of C, C therefore measures B. Now as C was to B as B<sup>16</sup> was to D, so C also measures D. D is therefore a multiple of C.

2

If an interval doubled makes a multiple whole, that same

[interval] will also be multiple. [Figure 1] Let there be interval BC such that C is to B as B is to D, and let D be a multiple of C. I say also that B is a multiple of C. For since D is a multiple of C, C therefore measures D. I know<sup>18</sup> that if—however many numbers are in proportion—the first measures the last, it will also measure those between.<sup>19</sup> Therefore, C measures B; therefore, B is a multiple of C.

3

With a superparticular interval, no mean number—neither one nor many—will fit in proportion.

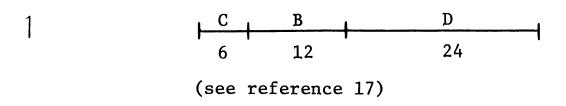
Let there be superparticular interval BC. Let DF, H be the smallest [numbers] in the same proportion with BC. Now these through the permanence of the monad<sup>20</sup> are measured by a common measure. Subtract, equal to H, GF. Since DF is the superparticular of H, the remainder DG is the common measure of both DF and H. Therefore, DG is a monad. Therefore, no mean will fit between DF and H. For what fits in will be less than DF and greater than H, so that the monad is divided, which indeed is impossible. Therefore, not a thing will fit between DF and H. Now however many means fit in proportion between the smallest [numbers], so many will also fit in proportion between [numbers] having the same ratio.<sup>21</sup> No [mean] will fit between DF and H; neither will one fit between B and C. [Figure 2]

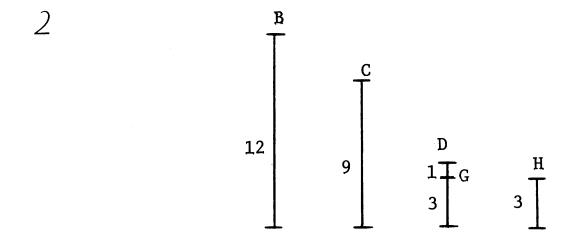
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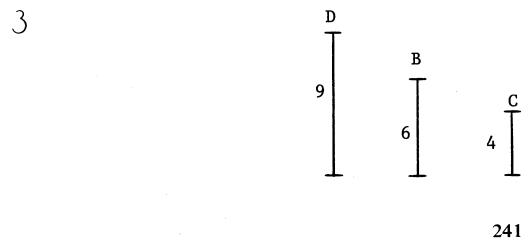
If a non-multiple interval is doubled, the whole will be neither multiple nor superparticular.

Let there be non-multiple interval BC and let it be that as C is to B, so B is to D. I say that D is neither the multiple nor the superparticular of C. First let D be the multiple of C. Accordingly, we know that if an interval doubled makes a multiple whole, that same [interval] also is multiple.<sup>22</sup> Therefore, B will be the multiple of C. But this was not true. It is therefore impossible for D to be a multiple of C; no, nor even a superparticular. For no mean fits in proportion with a superparticular interval.<sup>23</sup> Between D and C fits B. It is therefore impossible for D to be either a multiple or a superparticular of C. [Figure 3]

## FIGURE







If an interval doubled does not make a multiple whole, neither will that same [interval] be multiple.

Let there be interval BC, and let it be that as C is to B so B is to D, and let D not be a multiple of C. I say that neither will B be a multiple of C. For if B is a multiple of C, therefore D will be a multiple of C.<sup>24</sup> But this is not true. Therefore B will not be a multiple of C.<sup>25</sup>

 $6^{26}$ 

The duple interval is composed from the two largest superparticular [intervals]—from the sesquialtera and the sesquitertia.

Let, on the one hand, BC be the sesquialtera of DF, and on the other hand, DF the sesquitertia of H. I say that BC is the duple of H. For I subtract, equal to H, FK, and [equal] to DF, CL. Accordingly, since BC is the sesquialtera of DF, BL therefore is a third part of BC and half of DF. And again, since DF is the sesquitertia of H, DK is a fourth part of DF and a third part of H. Accordingly, since DK is a fourth part of DF, and BL is half of DF, DK therefore will be half of BL. Now BL was a third part of BC. Therefore, DK is a sixth part of BC. Now DK was a third part of H. Therefore, BC is the duple of H. [Figure 4]

### By another proof<sup>27</sup>

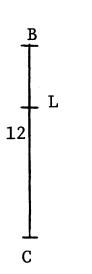
Let A be the sesquialtera of B, and B the sesquitertia of C. I say that A is the duple of C.

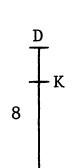
Since A is the sesquialtera of B, A therefore contains B and the half of it. Therefore two A's are equal to three B's. Moreover, since B is the sesquitertia of C, B therefore contains C and the third of it. So, three B's are equal to four C's. Now three B's are equal to two A's. So, two A's are equal to four C's. A therefore is equal to two C's. Therefore, A is the duple of C. [Figure 5]

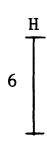
 $7^{29}$ 

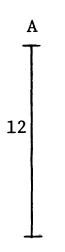
From a duple interval and a sesquialtera, a triple interval occurs.

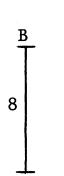
## FIGURE













Let A be the duple of B, and B the sesquialtera of C. I say that A is the triple of C.

Since A is the duple of B, A therefore is equal to two B's. Moreover, since B is the sesquialtera of C, B therefore contains C and the half of it. So, two B's are equal to three C's. And two B's are equal to A. A therefore is also equal to three C's. Thus, A is the triple of C. [Figure 6]

8

If from a sesquialteran interval, a sesquitertian interval is subtracted, the remainder left is a sesquioctaval [interval].

Let A be the sesquialtera of B and C the sesquitertia of B. I say that A is the sesquioctave of C.

Since A is the sesquialtera of B, A therefore contains B and the half of it. Therefore, eight A's are equal to twelve B's. Moreover, since C is the sesquitertia of B, C therefore contains B and the third of it. Nine C's are therefore equal to twelve B's, and twelve B's are equal to eight A's. Eight A's are therefore equal to nine C's. A therefore is equal to C and the eighth of it. A therefore is the sesquioctave of C. [Figure 7]

9

Six sesquioctaval intervals are greater than one duple interval.

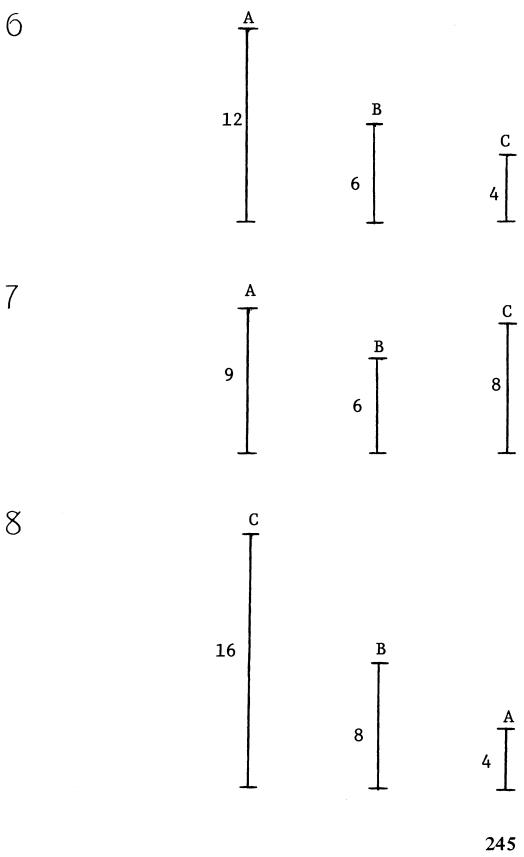
Let A be one number, let B be the sesquioctave of A, C the sesquioctave of B, D the sesquioctave of C, E the sesquioctave of D, F the sesquioctave of E, and G the sesquioctave of F. I say that G is greater than the duple of A.

Since we know to find seven numbers sesquioctaval to one another,<sup>30</sup> let A, B, C, D, E, F, and G be found and A be 262,144;

B be 294, 912; C be 331, 776; D be 373, 248; E be 419,904; F be 472,392; G be 531,441;

and G is greater than the double of A.31

## FIGURE



The octave interval is multiple.<sup>32</sup>

Let the nete of the hyperbolaion<sup>33</sup> be A, the mese B, and the proslambanomenos C. Thus, interval AC, being a double octave, is consonant.<sup>34</sup> Now it is either superparticular or multiple.<sup>35</sup> It is not superparticular; for no mean fits in proportion with a superparticular interval.<sup>36</sup> Therefore, it is multiple. Since the two intervals<sup>37</sup> AB and BC added together make a multiple whole, [interval] AB is therefore also multiple.<sup>38</sup> [Figure 8]

11

The interval of a fourth and of a fifth are each superparticular.

Let the nete of the synemmenon be A, the mese B, and the hypate of the meson C. Thus, interval AC, being a double fourth, is dissonant.<sup>39</sup> Therefore, it is not multiple. Now since two equal intervals, AB and BC, added together make a non-multiple whole, neither is AB multiple.<sup>40</sup> And it is consonant. Thus, it is superparticular.<sup>41</sup> The same proof also [applies] to the fifth. [Figure 9]

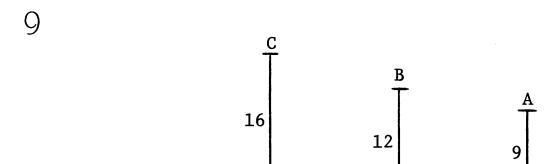
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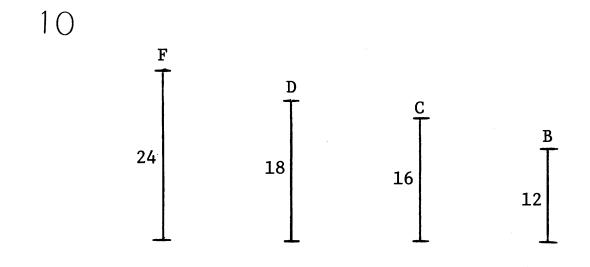
The octave interval is duple.

We proved that it is multiple.<sup>42</sup> Accordingly, it is either duple, or greater than duple. But since we proved that a duple interval is compounded from the two largest superparticulars,<sup>43</sup> and if the octave will be greater than duple, it will not be compounded from only two superparticulars, but from more, then it is compounded from two consonant intervals, from the fifth and the fourth; and the octave, therefore, will not be greater than duple. It is therefore a duple [interval].

But indeed, since the octave is duple, and the duple [interval] is combined from the two largest superparticulars, the octave also is combined from the sesquialtera and the sesquitertia, for these *are* the largest.<sup>44</sup> That is, it is combined from the fifth and fourth, which are superparticular.<sup>45</sup> Thus the fifth, as it is the larger, would be sesquialtera, and the fourth sesquitertia.<sup>46</sup>

# FIGURE





It is surely apparent that the octave and a fifth is a triple interval. For we proved that from a duple interval and a sesquialtera, a triple interval arises,<sup>47</sup> so also is an octave and a fifth a triple [interval].

The double octave is a quadruple [interval].<sup>48</sup>

Therefore, each of the consonant [intervals] has been shown in what ratios [each] has notes bounding one another.<sup>49</sup>

13

It remains necessary<sup>50</sup> to remark, concerning the wholetone interval, that it is sesquioctaval.

For we know that if a sesquitertian interval is subtracted from a sesquialteran interval, the remainder left is sesquioctaval.<sup>51</sup> If now a fourth is subtracted from a fifth, the remainder is a whole-tone interval. Therefore, the whole-tone interval is sesquioctaval.<sup>52</sup>

14

The octave is less than six tones.

For the octave was proved duple,<sup>53</sup> and the tone sesquioctaval.<sup>54</sup> Six sesquioctaval intervals are greater than a duple interval.<sup>55</sup> Therefore, the octave is less than six tones.

15

The fourth is less than two and a half tones, and the fifth is less than three and a half tones.

Let the nete of the diezeugmenon be B, the paramese C, the mese D, and the hypate of the meson F. Accordingly, interval CD is a tone, and BF-being an octave—is less than six tones.<sup>56</sup> The remaining [intervals] therefore, both BC and DF being equal, are less than five tones.<sup>57</sup> So, there<sup>58</sup> are less than two and a half tones in BC, which is a fourth, and BD is less than three and a half tones, which is a fifth. [Figure 10]

16

The tone will not divide into two equal [intervals], nor into more.

It has been proved that [the tone] is superparticular.<sup>59</sup> With a superparticular interval, neither many nor one mean

fits in proportion.<sup>60</sup> Therefore, the tone will not divide into equal [intervals].

 $17^{61}$ 

Paranetai and lichanoi will be found through consonance as follows.<sup>62</sup> Let the mese be B. Let a fourth be tightened to C, and from C, let a fifth be loosened to D. Therefore BD is a tone. Moreover, from D let a fourth be tightened to E, and from E let a fifth be loosened to F. Therefore FD is a tone. Therefore FB is a ditone. Thus, F is a lichanos. Likewise will the paranetai also be found.<sup>63</sup> [Figure 11]

18

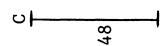
Parhypatai and tritai do not divide the pycnon<sup>64</sup> into equal [intervals].<sup>65</sup>

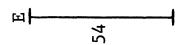
Let the mese be B, the lichanos C, and the hypate D. Let a fifth be loosened from B to F. FD is therefore a tone. And from F let a fourth be tightened to E. Therefore, interval FD is a tone, and also CE.<sup>66</sup> Let the common [interval] DC be added. Therefore FC is equal to DE.<sup>67</sup> FE is a fourth. Therefore, no mean fits in proportion with FE, for the interval is superparticular.<sup>68</sup> Also, DF is equal to CE.<sup>69</sup> Therefore, no mean will fit with DC, which is from the hypate to the lichanos. Therefore, the parhypate does not divide the pycnon into equal [intervals]. Likewise, neither [does] the trite.

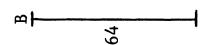
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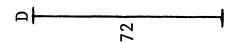
To mark the monochord according to the so-called immutable system.

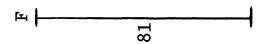
Let there be the length of the monochord, which is also [the length] of the string, AB, and let it be divided into four equal [intervals] by C, D, and E. There will therefore be BA, which is the lowest Bombyx<sup>70</sup> note. This AB is the sesquitertia of CB, so CB will be consonant with AB a fourth higher. AB is also the proslambanomenos. Therefore CB will be the diatonic hypaton.<sup>71</sup> Moreover, since AB is the double of BD, it will be consonant as an octave, and BD will be the mese. Moreover, since AB is the quadruple of EB, EB will be the nete hyperbolaion. I cut CB in two at F. And CB will be the duple of FB, so that CB is consonant as an octave with









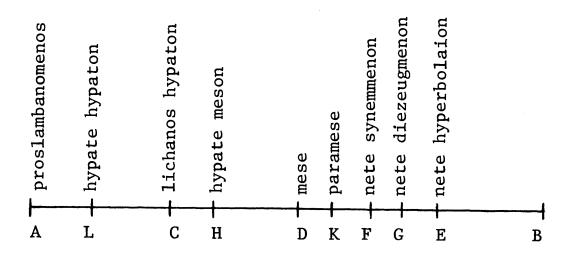


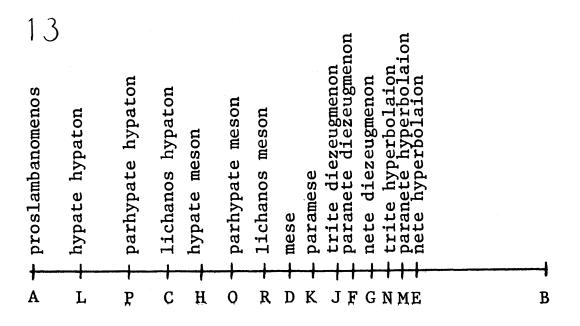
FB. So FB is the nete synemmenon. I take DG, the third part of DB. And DB will be the sesquialtera of GB, so DB will be consonant with GB as a fifth. Therefore, GB will be the nete diezeugmenon. I establish GH equal with GB, so HB will be consonant as an octave with GB, thus HB is the hypate meson. I take HK, the third part of HB. And HB will be the sesquialtera of KB, so KB is the paramese. I take LK, equal with KB, and LB will be the low hypate. Therefore, every note 72 of the immutable system will be found in the monochord. 73 [Figure 12]

20

It remains necessary to consider the movable [notes]. I cut EB in eight, and one equal [part] of these I establish EM, so MB becomes the sesquioctave of EB. Moreover, MB divides in eight, and one equal [part] of these I establish NM. Therefore, by a tone, NB will be lower than BM, and MB than BE, so NB will be the trite hyperbolaion, and MB the diatonic hyperbolaion. I take the third part of NB and establish NJ, so JB is the sesquitertia of NB and is consonant as a fourth lower, and JB becomes the trite diezeugmenon. Moreover, taking the half part of JB, I establish JO, so OB is consonant as a fifth with JB. Therefore, OB will be the parhypate meson. And equal to JO, I establish OP, so PB becomes the parhypate hypaton. Now I take—of BC—a fourth part, CR, thus RB becomes the diatonic meson. Figure 13

## FIGURE





### REFERENCES

- 1. It will not be profitable here to consider the pro and con of its authenticity. The principal viewpoints of both sides are detailed by Karl von Jan, Musici scriptores graeci (Leipzig: B. G. Teubner, 1895; reprint ed., Hildesheim: Olms, 1962), pp. 115-20; Henricus Menge, ed., Euclid, Phaenomena et scripta musica (Leipzig: B. G. Teubner, 1916), pp. xxxvii-xlii; Paul Tannery, "Inauthenticité de la 'Division du canon' attribuée à Euclide," Comptes rendus des séances de l'année 1904 de l'Académie d'Inscriptions et Belles-Lettres (1904), pp. 439-45; Charles-Emile Ruelle, "Sur l'authenticité probable de la division du canon musical attribuée à Euclide," Revue des études grecques 19 (1906): 318-20; and Ingemar Düring, Ptolemaios und Porphyrios über die Musik (Göteborg: Elanders, 1934), p. 177. Likewise, the question of whether the Division is a little earlier or a little later than Aristoxenus' Harmonics is of no particular significance. Both of these works are certainly based on earlier writings that obviate the very question.
- 2. All the positions are found, although the variant names that are possible for the higher notes (because of the difference between the disjunct and the conjunct tetrachord) are not all cited.
- 3. Quoted by Porphyrios in his commentary on Ptolemy's Harmonics. See Ingemar Düring, ed., Porphyrios Kommentar zur Harmonielehre des Ptolemaios (Göteborg: Elanders, 1932), pp. 99-103.
- 4. Menge, pp. 158-83.
- 5. "Euclid's Introduction to the Section of the Canon," in Charles Davy, Letters, addressed chiefly to a young gentleman, upon subjects of literature. . . (Bury St. Edmonds: [Author], 1787), 2:264-90.
- 6. Jan, pp. 148-66.
- 7. Menge, p. 160, line 12 reads ἡν δὲ και ὡς ὁ Γ πρὸς τὸν Β, ὁ Γ πρὸς τὸν Δ; instead of ἡν δὲ και ὡς ὁ Γ πρὸς τὸν Β, ὁ Β πρὸς τὸν Δ. His translation on page 161 does not repeat the error; he correctly reads: Γ:Β=Β:Δ.
- 8. Listings of other earlier texts and translations may be found in my Bibliography of Sources for the Study of Ancient Greek Music (Hackensack, N.J.: Boonin, 1974).
- 9. The relation between motion and sound—and especially between motion and musical sound—was of considerable concern to the fourth-century writers, notably Aristotle and Aristoxenus. See Arist. Ph. 226b, and De An. 419b-421a for general comment; and directly relative to Euclid's remarks, see Arist. Ph. 232a10-15, and Aristox. Harm. 1. 9-10, 12, 32.
- 10. The Greek theorists regularly speak of pitches in terms of tighter or

- looser strings. So instead of saying "lowered" or "raised," they normally say "loosened" (ἀνίημι) or "tightened" (ἐπιτείνω).
- 11. This postulate provides the foundation for the format of the body of the treatise, as Ruelle, p. 319, observes. The bulk of the treatise is based on particular Pythagorean theorems and traditions; for an effective general treatment of Pythagorean concepts as they relate to Greek music theory, see Richard L. Crocker, "Pythagorean Mathematics and Music," Journal of Aesthetics and Art Criticism 22 (1963-64): 189-98, 325-35.
- 12. This rather opaque passage does not suggest, as Edward A. Lippman proposes in his study, Musical Thought in Ancient Greece (New York: Columbia University Press, 1964), p. 154, that the two ratios can be expressed in Greek by a single word. Euclid is noting that multiple and superparticular ratios are related or "ordered" by the single term "consonant." The definition is more clearly expressed by Porphyrios just before he begins his quotation from Euclid's Division: "Now concerning unequal ratios, the multiple and the superparticular are superior to the superpartient, as concerning unequal tones, the musical and the consonant are superior to the dissonant. It is necessary to take superparticular and multiple ratios as consonant, and superpartient as dissonant" (Düring, ed., Porphyrios, p. 98, lines 3-6).
- 13. The Greek theorists distinguish between a blend  $(\kappa \rho \tilde{a} \sigma \iota \varsigma)$  and a mixture  $(\mu \iota \xi \iota \varsigma)$ . In a blend, the different components lose their separate identities and are homogenized; in a mixture, the components retain their separate identities and are not homogenized.
- 14. "Interval" at this point simply refers to the distance between respective magnitudes. Aristotle uses the term in precisely this manner in Ph. 202a18. Only later will the analogy with pitches be made.
- 15. Greek letter designations in the text are uniformly changed here to Latin letters in the same order.
- 16. Menge, p. 160, line 12 has  $\delta \Gamma \pi \rho \delta \zeta \tau \delta \nu \Delta$ , which is clearly incorrect. The  $\Gamma$  must be a misprint. Cf. Reference 7.
- 17. The line drawings appear inconsistently throughout the MSS, but as they are helpful, I have included them here. This drawing demonstrates Propositions 1 and 2.
- 18. Menge, p. 162, line 3 reads with Porphyrios and W ἐμαθομεν. ἔμαθον, the reading of the rest of the sources, is equally good and is used here. It should be noted, however, that ἐμάθομεν parallels Menge, p. 164, line 8, where it appears in Proposition 4.
- 19. Euclid Elements 8. 7.
- 20. An indivisible unity.
- 21. Euclid Elements 8. 8.
- 22. Proposition 2.
- 23. Proposition 3.
- 24. Proposition 1.
- 25. The diagram for Proposition 4 also applies to this proposition.
- 26. Porphyrios combines this proposition with the next by using the

first paragraph of this proof and all of the following proof. See Düring, ed., *Porphyrios*, p. 100.

- 27. This proof is omitted by Davy.
- 28. This and the preceding sentence are omitted by Porphyrios.
- 29. Porphyrios inserts before this proposition an additional proof that demonstrates that only the duple ratio can be made by adding the two largest superparticular ratios—3:2 + 4:3 = 2:1.
- 30. Euclid Elements 8. 2.
- 31. The demonstration of this continued proportion is arranged:

8(A)	8	8	8	8	8
9(B)	8(B)	8	8	8	8
9	9(C)	8(C)	8	8	8
9	9	9(D)	8(D)	8	8
9	9	9	9(E)	8(E)	8
9	9	9	9	9(F)	8(F)
9	9	9	9	9	9(G)

Multiplying the horizontal rows produces the seven smallest whole numbers in continued sesquioctaval ratio. Euclid notes in a Porism to *Elements* 8. 2.: "If three numbers in continued proportion be the least of those which have the same ratio with them, the extremes of them are squares, and, if four numbers, cubes" (Trans. by T. L. Heath, *The Thirteen Books of Euclid's Elements* [Chicago, 1952], p. 151). As we have seven numbers here (to create six intervals), the extremes will be to the sixth power.

- 32. At this point, "interval" begins to be applied as a musical term.
- 33. The order of the notes and tetrachords may be seen in the illustration to Proposition 20.
- 34. The names and relationships between the various notes are taken for granted; this conclusion is a conclusion by definition. The object in these next propositions is to establish the proportional basis of intervals (and indirectly, of notes, which define intervals) in the Greater Perfect System. We must assume that the order of notes and their functions have been established in earlier works. It seems likely that to some extent this treatise is an attempt to reconcile Pythagorean and what would later be called Aristoxenian schools, or the mathematical and the empirical. This reconciliation seems first to have been observed by Johannes Wallis, "De veterum Harmonica ad hodiernam comparata," in Claudii Ptolemaei Harmonicorum libri tres. Ex Codd. MSS. Undecim, nunc primum Graece editus (Oxonii, e Theatro Sheldoniano, 1682), p. 307. Indeed, the striking differences in procedure between Euclid's Division and Aristoxenus' Harmonics have been emphasized at the expense of noting their similarities. Several authors have treated the relationship between the Pythagoreans and Aristoxenus at some length, especially Richard L. Crocker, "Aristoxenus and Greek Mathematics," Aspects of Medieval and Renaissance Music. A Birthday Offering to Gustave Reese, ed. Jan La Rue (New York: W. W. Norton, 1966), pp. 96-110; Norman Cazden, "Pythagoras

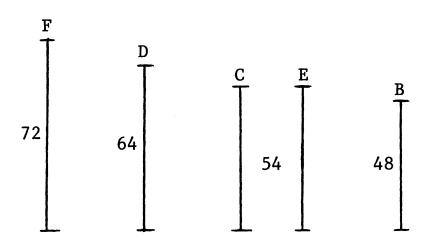
- and Aristoxenos Reconciled," Journal of the American Musicological Society 11 (1958): 97-105; and Reginald P. Winnington-Ingram, "Aristoxenus and the Intervals of Greek Music," Classical Quarterly 26 (1932): 195-208.
- 35. By definition. Euclid formulates the definition in the "introduction" to the theorems.
- 36. Proposition 3.
- 37. Menge, p. 170, line 26 preserves Meibom's addition ἐπει οὖν δύο [ἴσα] διαστήμαπα (since the two [equal] intervals. . . ). The intervals, however, are equal by definition; the emendation is unnecessary.
- 38. Proposition 2.
- 39. Proposition 4 and the introduction.
- 40. Proposition 5.
- 41. By definition.
- 42. Proposition 10. This sentence is omitted by Porphyrios.
- 43. Proposition 6.
- 44. "the octave also . . . the largest" is omitted by Porphyrios.
- 45. Proposition 11.
- 46. Here the fifth and the fourth (musical intervals) are expressly related to the sesquialtera and the sesquitertia (mathematical intervals).
- 47. Proposition 7.
- 48. Porphyrios omits this sentence.
- 49. Davy, 2:281, elaborates: "It is demonstrated that these three intervals, viz. διαπασῶν, διαπασῶν with διαπέντε, and δισδιαπασῶν, are respectively in duple, triple, and quadruple ratio."
- 50. Menge, p. 174, line 9 reads with Porphyrios and B  $\delta\dot{\eta}$ , but I prefer with M  $\delta\epsilon\tilde{\iota}$ .
- 51. Proposition 8.
- 52. The Greek theorists frequently distinguish between a whole-tone (τονιαῖος) interval-9:8-and a tone (τόνος), which is a general term referring to any and all sizes of tones.
- 53. Proposition 12.
- 54. Proposition 13.
- 55. Proposition 9.
- 56. Proposition 14.
- 57. The remaining intervals are less than *five* tones because of the additional tone of disjunction between C and D.
- 58. "are less than five tones. So, there" is omitted by Porphyrios.
- 59. Proposition 13.
- 60. Proposition 3.
- 61. This and the following propositions are not quoted by Porphyrios.
- 62. The movable notes considered here are regarded in terms of the enharmonic tetrachord rather than the diatonic tetrachord, hence the ditone between the mese and the lichanos.
- 63. The paranetai and lichanoi are the more important of the so-called movable notes since they indicate the various colors and shades of the tetrachords. Aristoxenus accordingly devotes much more time

- to the movements of these notes (Harm. 1. 22-26) than he does to the movements of the parhypatai and tritai (Harm. 1. 26-27).
- 64. The pycnon is that area bounded by the lower stationary note (the hypate or the mese or the paramese) and the upper movable note of the tetrachord (the lichanos or the paranete). Any area bounded by these notes is a pycnon as long as it is smaller than the remaining area in the tetrachord—that bounded by the upper movable note and the upper stationary note. The pycnon's size is not limited to a few predetermined intervals (Aristox. Harm. 1, 24, 26).
- 65. Paralleling the previous proposition, this also considers the movable notes in the context of the enharmonic tetrachord.
- 66. Menge, p. 178, line 4 follows Jan's emendation and reads  $\tau \dot{o}$  Z $\Delta$ διάστημα και το BE. The codices, however, read το ΖΔ διάστημα  $\kappa a i \tau \delta \Gamma E$ . Jan has been misled by the line drawing in N that shows equal lengths for  $\Gamma(C)$  and E(E) (see Figure 14). But the line drawing of N cannot be allowed because it places the lichanos (C) too high for there to be a pycnon. The emendation (apart from the line drawing) would be possible, because in fact there is a tone between B and E, but this is not the point of the statement. The point is to position C (the lichanos) and to show that it again is in lowered position, indicating an enharmonic tetrachord. This is done by noting that CE is a tone. Since a fifth was lowered from the mese (BF) and a fourth was raised from that (FE), a tone below mese is established and needs no further demonstration. The position of C does need to be established, however, and so Euclid states that CE is a tone, thereby placing the lichanos (C) a ditone below the mese -the same position it had in the previous proposition.
- 67. DC is the common interval between FC and DE. FC and DE are constructed by adding the common DC to the previously established CE and FD (see Figure 15). Yet Menge, p. 178, line 5 follows Jan's emendation and reads τὸ ἄρα ΖΕ ἴσον ἐστὶ τῷ ΔΕ; I have followed this reading. Once again the emendation would be possible were it not for the fact that the point of the proportion is to note that after the common interval DC has been added the new intervals FC and DE are also equal. There is no need to note that FE and BD are equal because that has been established previously in the proposition.
- 68. Proposition 3.
- 69. Menge, p. 178, line 8 follows Jan's emendation and reads καί ἐστιν ἴσος ὁ ΔΒ τῷ ΖΕ. The codices, however, read καί ἐστιν ἴσος ὁ ΔΖ τῷ ΓΕ; I have followed this reading. Once again, the emendation is possible but unnecessary.
- 70. The Bombyx is a device used for lowering the tone of the aulos. See Kathleen Schlesinger, *The Greek Aulos* (London: Methuen, 1939; reprint ed., Groningen: Bouma, 1970), p. 74.
- 71. Or in other words, CB will be the lichanos hypaton. Euclid is supplying the Greater Perfect System notes in the context of diatonic tetrachords despite the fact that in the two previous

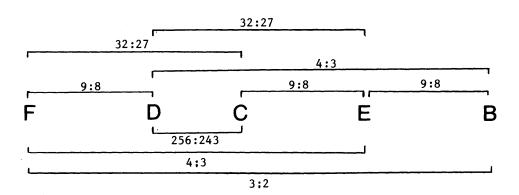
propositions, he has spoken in terms of enharmonic tetrachords. This inconsistency points to the possibility that this and the following demonstrations were added later.

- 72. Menge, p. 180, line 14 follows Jan's emendation and reads πάντες οι [ἐστῶτες] φθόγγοι (every [stationary] note).
- 73. All of this section is based on Proposition 12.
- 74. Or in other words, MB will be the paranete hyperbolaion.
- 75. Or in other words, RB becomes the lichanos meson.

## FIGURE 14



15





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## ARISTOXENUS AND THE INTERVALS OF GREEK MUSIC.

ANCIENT Greek music was purely or predominantly melodic; and in such music subtleties of intonation count for much. If our sources of information about the intervals used in Greek music are not always easy to interpret, they are at any rate fairly voluminous. On the one hand we have Aristoxenus, by whom musical intervals were regarded spatially and combined and subdivided by the processes of addition and subtraction; for him the octave consisted of six tones, and the tone was exactly divisible into fractions such as the half and quarter, so that the fourth was equal to two tones and a half, the fifth to three tones and a half, and so on. On the other hand we have preserved for us in Ptolemy's Harmonics the computations of a number of mathematicians, who realized correctly that intervals could only be expressed as ratios (e.g. of string-lengths), that the octave was less than the sum of six whole tones and that this tone could not be divided into equal parts. These authorities are Archytas, the Pythagorean of the early fourth century, Eratosthenes (third century), Didymus (first century) and Ptolemy himself (second century A.D.). these we must add the scale of Plato's Timaeus (35B) and, closely related to it, the computations of the pseudo-Philolaus (ap. Boethium, Mus. III, 8) and of Boethius himself (IV, 6). Aristoxenus is less easy to understand than the mathematicians because of the unscientific nature of his postulates. His importance, however, is very great, not only from his comparatively early date but because he claims to champion the direct musical consciousness against the scientific approach of some of his predecessors and contemporaries. But if they are under suspicion of letting irrelevant factors intrude into their calculations, he must equally be suspected of yielding to the attractions of symmetry and convenience. Only their mutual agreement, perhaps, can establish any point strongly. This article is an attempt, first of all, to state what precisely Aristoxenus says directly or by implication about the intervals of Greek music, secondly, to compare his evaluations with the ratios of the mathematicians and so consider what his rough-and-ready mathematics may conceal in the way of real musical intervals.

I. In the fragments of Aristoxenus' writings known to us as the Harmonic Elements are preserved two separate but similar accounts of the genera or  $\gamma \hat{\epsilon} \nu \eta \tau \hat{\eta} \hat{s}$   $\mu \epsilon \lambda \phi \delta \hat{\iota} \alpha s$  (I, pp. 21-27; II, pp. 46-52, Meibom). Like theorists before and after him he considers a typical tetrachord or group of four notes composing the interval of the fourth, of which the extremes ( $\mu \hat{\epsilon} \sigma \eta$ ,  $\hat{\nu} \pi \hat{\alpha} \tau \eta$ ) remaining fixed the means ( $\lambda \iota \chi \alpha \nu \hat{o} s$ ,  $\pi \alpha \rho \nu \pi \hat{\alpha} \tau \eta$ ) move in each of the three genera (diatonic, chromatic, enharmonic) within a certain locus. The genera are characterized by these loci; the nuances ( $\chi \rho \hat{\iota} \alpha \iota$ ) are special cases of each genus, selected by Aristoxenus on a principle that will be discussed later. These loci he sets out to discover (22, 24), taking first the higher note,  $\lambda \iota \chi \alpha \nu \hat{o} s$ . The upper limit he finds in the distance of a tone from  $\mu \hat{\epsilon} \sigma \eta$ , appealing to the practice of the diatonic genus.<sup>2</sup> The lower limit is a matter of controversy, in which Aristoxenus' emotions are closely engaged. In his view the  $\lambda \iota \chi \alpha \nu \hat{o} s$  that is separated by a ditone from  $\mu \hat{\epsilon} \sigma \eta$  was not only a real fact of music but characterized

<sup>&</sup>lt;sup>1</sup> Gevaert (*Histoire et Théorie* I., pp. 304-327) was the first to give these formulae the importance that is their due. This article owes much also to the work of P. Tannery (*Mémoires* 

Scientifiques III, 97-115, reprinted from Revue des Et. Gr. XV, 336-352).

 $<sup>^2</sup>$  22, 33 οὐχ before ὁμολογεῖται is rightly bracketed by Macran.

its noblest and most beautiful type, as employed in certain ancient styles to which he refers. To his grief this true enharmonic is being banished by contemporary performers, who prefer the higher lichanos of the chromatic, and even when they employ the enharmonic approximate it to the chromatic with an inevitable alteration of character. The implications of this passage (23, 4-22) are of the utmost importance.

The locus of lichanos is thus a tone. That of  $\pi \alpha \rho \nu \pi \acute{a} \tau \eta$  is the smallest diesis, i.e. a quarter-tone, since it is never less than a quarter-tone or more than a semitone above  $\delta\pi\acute{a}\tau\eta$ . The two loci, then, meet at a point a semitone above  $\delta\pi\acute{a}\tau\eta$ . Aristoxenus now turns to consider the genera and nuances individually. He defines a πυκνόν as a combination of two intervals which together are less than the remaining interval that makes up the fourth. The smallest pycnon consists of two smallest enharmonic dieses (he has already -p. 21 -defined the smallest enharmonic diesis as a quarter of a tone, the smallest chromatic diesis as a third); next to it comes that which consists of two smallest chromatic dieses. And so on. Aristoxenus establishes the position of lichanos in each of his six nuances. We need not follow the details here, but we may notice certain points. His use of the imperative of definition suggests perhaps something arbitrary. And indeed on his own assumptions it must be so. If lichanos moves within a certain locus, then theoretically it may occupy an infinity of positions (26, 14  $\nu o \eta \tau \acute{e} o \nu \gamma \grave{a} \rho \acute{a} \pi \epsilon \acute{i} \rho o \upsilon s \tau \acute{o} \nu \acute{a} \rho \iota \theta \mu \grave{o} \nu \tau \grave{a} s \lambda \iota \chi \acute{a} \nu o \upsilon s$ ). There is not one enharmonic lichanos solely. Aristoxenus' argument is not that the δίτονος λιχανός gives the only enharmonic intonation, but that it gives the best.

Secondly, note the great importance given to the note lichanos in establishing the nuance and the relatively small stress laid upon parhypate, to which he turns in 26, 29. There are two loci of parhypate, one peculiar to the enharmonic, the other shared by the chromatic and diatonic. This for the first time brings us to the question of the combination of lichanos and parhypate in a single nuance and the relative size of the three intervals of the typical tetrachord. So far we have only been told that the smallest (enharmonic) pycnon consists of two smallest enharmonic dieses, the next smallest (soft chromatic) of two smallest chromatic dieses. Does this imply that the constituent intervals of a pycnon are always equal? On p. 27, 2 it is laid down that (1) the lowest interval  $(i\pi \dot{\alpha}\tau \eta - \pi a\rho v\pi \dot{\alpha}\tau \eta)$  is either equal to or less than the middle one  $(\pi \alpha \rho \nu \pi \acute{a} \tau \eta - \lambda \iota \chi \alpha \nu \acute{a}s)$ ; (2) the middle interval is either equal to, less or greater than the highest ( $\lambda i \chi a \nu \delta s - \mu \epsilon \sigma \eta$ ). To illustrate this last possibility he appeals to the sharing of  $\pi \alpha \rho \nu \pi \acute{a} \tau \alpha \iota$  by chromatic and diatonic; that tetrachordal division also is legitimate that has the lowest chromatic parhypate and the highest diatonic lichanos; or, to express it in figures:  $\frac{1}{3} + 1\frac{1}{6} + 1$ . We shall see the importance of this later. This still leaves untouched the question of the division of a pycnon proper, except, apparently, in the cases of the enharmonic and lowest chromatic. We must now turn to the parallel passage in Book II.

On the way thither, however, we may note a passage on p. 44, where there is a reference to mixture of the genera. This mention of mixed types (cf.  $\mu\iota\gamma\nu\nu\mu\acute{\epsilon}\nu\omega\nu$   $\tau^{\hat{\omega}\nu}$   $\gamma\epsilon\nu^{\hat{\omega}\nu}$  7, 3; also Cleonides 9, 30) is yet more evidence that Aristoxenus was prepared to admit considerable variety within the framework of his scheme.

In Book II, 46, 19 Aristoxenus begins with a brief description of the loci of lichanos and parhypate in slightly different terms. He then answers the objection that notes bounding different magnitudes should be called by different names. Among other arguments he points out that this would make necessary an infinity of names. It would also be impossible (and this is the point of interest) to decide between rival claimants for the title of e.g. lichanos. τί μᾶλλον τὴν δίτονον λιχανδν

ing passage in Book II. There is no reason why Aristoxenus should not have been more precise here than there and in III, 73 (τη̂s παρυπάτης ἐπὶ βαρὺ κινηθείσης).

<sup>1</sup> P. 27, 9: the text is corrupt, but Macran's χρωματικης της βαρυτάτης for χρωματικης παρυπάτης is almost certainly right. Marquard imported the more general phrase used in the correspond-

λεκτέον ἢ τὴν μικρῷ συντονωτέραν; ἀρμονία μὲν γὰρ εἶναι τῷ αἰσθήσει κατ ἀμφοτέρας τὰς διαιρέσεις φαίνεται, τὰ δὲ μεγέθη τῶν διαστημάτων δῆλον ὅτι οὐ ταὐτὰ ἐν ἑκατέρα τῶν διαιρέσεων. Again we have admission of a type of enharmonic whose lichanos was slightly higher than the δίτονος  $\lambda\iota\chi$ ανός that Aristoxenus approved, but still unmistakably enharmonic.

At 50, 15 he redefines πυκνόν. He then proceeds to give those tetrachordal divisions 'which stand out from the rest as familiar (ἐξαίρετοί τε καὶ γνώριμοι), because the magnitudes of the intervals in them are familiar' [Macran]. Thus he gives one enharmonic  $(\frac{1}{4} + \frac{1}{4} + 2)$  and three chromatic,  $\mu\alpha\lambda\alpha\kappa\delta\nu$   $(\frac{1}{3} + \frac{1}{3} + 1\frac{5}{6})$ ,  $\eta\mu\iota\delta\lambda\iota\nu\nu$   $(\frac{3}{8} + \frac{3}{8} + 1\frac{3}{4})$ ,  $\tau o \nu \iota a \hat{i} o \nu \left(\frac{1}{2} + \frac{1}{2} + \mathbf{I} \frac{1}{2}\right)$ . In the description the emphasis is on lichanos again (that is, on the total size of the pycnon), but here it is definitely stated that these pycna are divided in half by parhypate. Up to this point, he says (51, 11), both notes move; after it parhypate stands still, having run through its locus, while lichanos rises by a quarter-tone; the division ceases to contain a pycnon, and we reach the first diatonic variety,  $\mu a \lambda a \kappa \acute{o} \nu \left(\frac{1}{2} + \frac{3}{4} + \frac{1}{4}\right)$ . One more diatonic remains, σύντονον  $\left(\frac{1}{2} + \frac{1}{4} + \frac{1}{4}\right)$ . There are then six different λιχανοί, one for each nuance, but only four παρυπάται, because the last three varieties have the same. Not only so (and this is the same significant addition as before), but all the three higher  $\pi a \rho \nu \pi \acute{a} \tau a \iota$  are common to diatonic and chromatic alike. Again we have the rules for the relative size of intervals in the tetrachord. But here the possibility that the lowest interval may be smaller than the middle one is illustrated not only from the diatonic but from the following particular case of the chromatic:  $\frac{1}{3} + \frac{2}{3} + 1\frac{1}{2}$ . καὶ γὰρ αἱ τοιαῦται διαιρέσεις τῶν πυκνῶν έμμελεῖς φαίνονται. 1 The intervals are still what Aristoxenus would call γνώριμα, but he has acknowledged that his standard types in which parhypate moves proportionately to lichanos are simplifications which do not cover all the possibilities of genuine melody. He goes on to deny that the lowest interval can be greater than the middle one, giving two divisions which he stigmatizes as  $dv d\rho \mu o \sigma \tau o \iota$ :  $\frac{1}{2} + \frac{1}{4} + 1\frac{3}{4}$ and  $\frac{3}{8} + \frac{7}{24} + 1\frac{5}{6}$ . As an instance of a middle interval greater than the highest Aristoxenus does not this time give the specific case of  $\frac{1}{3} + 1\frac{1}{6} + 1$ , but speaks generally of the combination of the highest diatonic lichanos with a parhypate lower than that which is a semitone above hypate. He excludes presumably the enharmonic parhypate, thus leaving two possibilities:  $\frac{1}{3} + 1\frac{1}{6} + 1$  (as in Book I) and  $\frac{3}{8} + 1\frac{1}{8} + 1$ .

To sum up, we may say that Aristoxenus' primary object is to delimit the spheres of enharmonic, chromatic and diatonic by defining the loci of the movable notes in each (a task, he says, never before attempted in theory: 35, 4); then within each of these to enumerate certain simple and intelligible types. He himself reveals that they do not represent all the genuinely melodious divisions, and in particular that equal division of the pycnon is not obligatory. Far less do they represent all conceivable divisions, which are infinite; and in particular he refers to an enharmonic lichanos lying between his lowest enharmonic and his lowest chromatic as being popular in his day but not accepted by him. Was it partly because he could not reduce the intervals it gave to  $\gamma \nu \omega \rho \mu \mu \mu \epsilon \gamma \epsilon \theta \eta$ ?

To facilitate comparison with tetrachordal divisions expressed in ratios, I here give the nuances that occur in Aristoxenus' account with the value of their intervals in logarithmic cents (1,200 to the octave) in brackets:<sup>3</sup>

- 1 The same possibility of equal or unequal division of a pycnon is expressed in III, 73, 20. In I, 29, 16 he says that the small intervals are equal  $\dot{\omega}s \dot{\epsilon} \pi l \tau \delta \pi o \lambda \dot{\nu}$ .
- <sup>2</sup> The latter is close to the enharmonic of Archytas, as we shall see, and the former not far from the chromatic of Didymus, both of which break this rule laid down by Aristoxenus and repeated by Ptolemy (*Harm.* II, 14). Was this
- chromatic in actual use at an early date? And is there a polemical purpose behind the selection of these two instances?
- $^3$  In order to give whole numbers I have allowed inconsistencies involving one cent in the figures for one and a half tones and between the three-quarter tone in the soft diatonic and the three-quarter tone pycnon of the  $\dot{\eta}\mu\iota\delta\lambda\iota\sigma\nu$   $\chi\rho\bar{\omega}\mu\alpha$ .

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Enharmonic: \frac{1}{4} + \frac{1}{4} + 2 (50 + 50 + 398). Diatonic: (\mu a \lambda a \kappa \delta v) \frac{1}{3} + \frac{1}{3} + 1\frac{5}{6} (66 + 66 + 366). (\sigma \iota \nu \tau \sigma \nu \sigma v) \frac{1}{2} + \frac{3}{4} + 1\frac{1}{4} (100 + 149 + 249). (\sigma \iota \nu \tau \sigma \nu \sigma v) \frac{1}{2} + 1 + 1 (100 + 199 + 199). Diatonics with chromatic parhypate: (\tau \sigma \nu \iota a \iota \sigma v) \frac{1}{2} + \frac{1}{2} + 1\frac{1}{2} (100 + 100 + 298). (\sigma \iota \nu \tau \sigma \nu \sigma v) \frac{1}{2} + \frac{1}{2} + 1\frac{1}{2} (100 + 100 + 298). (\sigma \iota \nu \tau \sigma \nu \sigma v) \frac{1}{2} + \frac{1}{2} + 1\frac{1}{2} (100 + 100 + 298). (\sigma \iota \nu \tau \sigma \nu \sigma v) \frac{1}{2} + \frac{1}{2} + 1\frac{1}{2} (100 + 100 + 298). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + \frac{1}{4} + 1\frac{1}{4} (100 + 149 + 249). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + \frac{1}{4} + 1\frac{1}{4} (100 + 149 + 249). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 149 + 249). (\sigma \iota \nu \tau \sigma \nu \sigma \nu) \frac{1}{2} + 1 + 1 (100 + 199 + 199).
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II. Enharmonic.—Eratosthenes apart, the evaluations of the enharmonic fall into two groups according as they make the pycnon consist of a major semitone  $(\frac{16}{15})$  or a leimma  $(\frac{256}{243})$ . To the former class belong: Archytas  $\frac{28}{27} \times \frac{36}{35} \times \frac{5}{4}$  (63+49+386): Didymus  $\frac{32}{31} \times \frac{31}{30} \times \frac{5}{4}$  (55 + 57 + 386): Ptolemy  $\frac{46}{45} \times \frac{24}{23} \times \frac{5}{4}$  (38 + 74 + 386). The lichanos here is a major third from  $\mu \epsilon \sigma \eta$ , less by a comma ( $\frac{81}{80} = 22$  c.) than the full ditone  $(\frac{9}{8} \times \frac{9}{8} = \frac{81}{64} = 408 \text{ c.})$ . The latter class is, in effect, based upon the diatonic sequence  $(\frac{256}{243} \times \frac{9}{8} \times \frac{9}{8})$  which we find in Plato's Timaeus. It is the product of  $\lambda \hat{\eta} \psi \iota_s \delta \iota \hat{\alpha} \sigma \nu \mu$ φωνίαs, and so to be found in those authors who give us a 'Sectio Canonis.' It has been held to be characteristic of the Pythagorean school, but on inadequate grounds. It certainly owed its later theoretical importance to the influence of Plato; and it is very doubtful if the Pythagoreans of the sixth and fifth centuries did more than establish the harmonic framework of standing-notes with the series of numbers 6, 8, 9, 12.1 There is reason to believe that the pseudo-Euclidean Sectio Canonis is an Academic document, while the enharmonic and chromatic tetrachords of the pseudo-Philolaus (l.c.) cannot possibly be Pythagorean, since they ignore the impossibility of equal division of tone and semitone, which must have been recognized by the early Pythagoreans. We need only note in passing that pseudo-Philolaus divides his enharmonic pycnon of a leimma into two equal diaschismata without attempting to evaluate the latter. Boethius (IV, 6) divides the  $\frac{256}{243}$  pycnon into  $\frac{512}{499} \times \frac{499}{486}$  by the naïve formula  $\frac{2x}{x+y} \times \frac{x+y}{2y} = \frac{x}{y}$ . The tetrachord of Eratosthenes is close to the ditonal scale with a slight variation:  $\frac{40}{39} \times \frac{39}{38} \times \frac{19}{16}$ .

Before we can consider which of these types Aristoxenus intended to represent by his enharmonic, we must of course be clear that he intended to represent one of them. The term 'equal temperament' is often used in connection with Aristoxenus; and in a sense by dividing the octave into six and the tone into two he has produced 'equal temperament.' But the difference between his procedure and the temperament of modern theory and practice is more important than their resemblance. Our equal temperament is dictated by practical convenience in the matter of modulation. The modern theorist knows that the intervals are distorted upon a tempered instrument and by how much. But Aristoxenus did not live in an age when temperament in the modern sense was either necessary or desirable. The very existence of such variant intonations as he describes would have reduced it to futility. He believed that his semitone was equal to half a tone; he did not say 'I will make a semitone which shall be half a tone, and that tone slightly less than a true tone.' He did not set out to distort slightly his fourths and fifths; but when in the course of experiment difficulties arose he said 'The consonances vary within a minute locus.' Four

1 It may be, as Tannery suggests, that confronted with the incommensurability of the tone and varying musical practice they relegated the movable notes to the realm of ἄπειρον and refused to speculate upon them, till Archytas tackled the problem on more realistic lines. Aristoxenus himself, who in Books I and II selected certain magnitudes as γνώριμα from the infinite possibilities, in Book III, 69, 6 affirms that in these matters of pitch and magnitude scientific treatment is impossible, since the possibilities are

unlimited; the functions and mutual arrangements of notes in the scale only are  $\pi \epsilon \pi \epsilon \rho \alpha \sigma \mu \epsilon \nu a$ .

<sup>2</sup> The ratios of Eratosthenes' enharmonic are dictated by his choice of the minor third  $\binom{6}{5}$  for the upper interval of his chromatic and by the assumption, made also by Didymus and Boethius, that the pycnon of the enharmonic should be equal to the lowest interval of the chromatic. Dividing his chromatic pycnon  $\frac{1}{9}$  into  $\frac{2}{19} \times \frac{1}{19} \times \frac{1}{19}$ , he then takes  $\frac{2}{19}$  as his enharmonic pycnon, leaving  $\frac{1}{19}$  for the highest interval.

passages throw light on his point of view. Two are from the first book, two from the second; and they seem to show a development. On p. 24 he shelves the question of the commensurability of the intervals making up the fourth, but decides to assume that it consists of two and a half tones (ώς φαινομένου ἐκείνου δύο τόνων καὶ ήμίσεος). The guilty conscience appears again on p. 28. The ditone, he says, is either eight times the smallest diesis or very slightly less. Between the writing of the two versions represented by Books I and II he seems to have devised an experiment, if it can be dignified by such a name, proving to his satisfaction that the fourth consists of two and a half tones. It is described on p. 56. We need not examine it in detail. Its success depends on a slight distortion of the fifths or fourths or both by means of which it is conducted; if these are all true the interval finally obtained will be in error by 24 cents. Its success, that is to say, in theory; for in practice a strictly accurate result was unlikely. Is it not a sufficient commentary upon it that, apart from the initial fourth and the supposed resulting fifth, it involves the judging by ear of ten successive consonances? If he had once after an accumulation of small errors obtained a recognizable fifth, would not that have satisfied him? How often did he conduct this operation? If it did not always come out right, it may have been this that led him in the fourth of our passages (p. 55) to say that even the magnitudes of the consonant intervals perhaps vary within an extremely minute locus (τόπον . . . παντελῶς ἀκαριαῖόν τινα). This is a very vague kind of 'temperament'!

Which, then, of the enharmonic types does Aristoxenus intend to represent by his enharmonic? His ditone of approximately 398 cents falls between the major third (386 c.) and the true ditone (408 c.). It is slightly closer to the latter, which I believe it to represent. Since Aristoxenus believed that his tone, ditone and semitone could be obtained by means of the consonances, there is surely a presumption that they are respectively  $\frac{9}{8}$ ,  $\frac{81}{64}$  and  $\frac{256}{243}$ . It needs a distortion of consonances to obtain 'equal temperament' by this method, but a still greater one to obtain the major third and semitone. There is a further reason. As we have seen in the earlier section, Aristoxenus more than once mentions a certain type of enharmonic as popular in his day. It had a slightly higher lichanos than the type he preferred, but was still genuinely enharmonic; that is to say, its highest interval was greater than that of his own lowest chromatic, greater than 366 cents. It is hard not to believe that his own δίτονος λιχανός is that which gives an upper interval of a strict ditone, while that which is μικρῷ συντονωτέρα gives the major third of Archytas' enharmonic. If that is so, Aristoxenus recognizes here, at least, the difference of a comma between the ditone and the major third. And this is the difference between a major and a minor tone. The further implications of this must wait till we consider the diatonic.

But if the ditone is really a ditone, then the semitone is really a leimma (90 c.), and less than an equal semitone, though nearer to it than is the major semitone (112 c.) on the other side. As a rough approximation this is as good as we can expect from our author. But we must here face a piece of evidence that tells against the interpretation that has been adopted. In a passage already noted (p. 28) Aristoxenus grudgingly admits that the ditone may be slightly less than eight times the enharmonic quarter-tone. That is, the semitone is slightly more, not slightly less, than the equal semitone. The passage would seem to point to the lichanos of Archytas. In that case, it is hard to conceive what the  $\mu \iota \kappa \rho \hat{\psi}$   $\sigma \iota \nu \tau \sigma \iota \omega \tau \hat{\epsilon} \rho a \lambda \iota \chi \alpha \iota \hat{\epsilon}$  can be. I think we can understand the working of Aristoxenus' mind which produced this statement without abandoning our first hypothesis. How did he arrive at the conclusion that the ditone might be less than eight quarter-tones? Not by adding quarter-tones together till he found out, certainly. It is a concession to mathematical doctrine in some form. It might, it is true, be an admission that the  $\frac{5}{4}$  interval of Archytas was less than four times  $\frac{1}{15}$ , if that fact had ever been

brought to Aristoxenus' notice. But it might also be due to a much simpler form of objection. It had certainly been established by mathematicians that the fourth was less than two whole tones and a half. Now Aristoxenus believed, first on faith, later on the evidence of a bad experiment, that his semitone was a correct half-tone. If any concession was to be made it should be made in the other direction: the ditone should be less than two full tones rather than the semitone less than half a tone.

Apart from this passage there is an objection of a more general kind that might be made to the view advanced. Aristoxenus claims to trust his ear and to represent the facts of practical music. If the ditonal scale was a theoretical elaboration of the Academy, it is unlikely that Aristoxenus had its intervals in mind for his enharmonic. Further, to our ears the scale of Archytas with its major third would appear far more melodious than the Platonic scale with its harsh third. The answer is suggested by various considerations. Aristoxenus' δίτονος λιχανός is clearly a lost cause. The enharmonic in any form is rarely attempted and when it is the δίτονος λιχανός is slightly raised. The process is described as one of 'sweetening' (γλυκαίνειν). What is this but the employment of the major third instead of the harsher ditone? Secondly, though the ditonal scale may owe its theoretical importance to Plato's Timaeus, it is absurd to suppose it was invented by him. Immediately the ratio expressing the tone  $(\frac{9}{8})$  had been discovered it was surely likely that theorists, not necessarily Pythagoreans, would try to evaluate the tetrachord by subtracting the tone twice from the interval of the fourth. By the remainder they were baffled, and it is quite possible that the speculations (and terminology) found in the pseudo-Philolaus are pre-Platonic. But, more important still, a scale of this sort is the direct result of tuning a stringed instrument by means of the consonances of the fifth and fourth. Starting from μέση A a fourth and a fifth give the two E's, a fourth upward D; a fifth downward from D gives G, a fourth upward from G C; thence a fifth downward F, and we have a diatonic scale consisting of major tones and leimmata. The effect must have been familiar, even if the tuning was subsequently adjusted to produce sweeter thirds. Indeed, Aristoxenus may be right in holding that this was the actual intonation of the older and severer style of music. That it did not entirely disappear is testified by Ptolemy, where he describes (Harm. I, 16; II, 16) the intonations most in use in his day for the lyre and cithara.2

As to the division of the pycnon, practice, at least in his day, may have approximated to Aristoxenus' version by aiming at strict equality. Eratosthenes and Didymus both give approximate equality in the pycnon, and the slight difference between the two ratios is really a mathematical fiction. Ptolemy's lower interval is little more than half the upper one and less than a fifth of a tone.<sup>3</sup> Both he and Aristoxenus declare that the lower should not be the greater; and, in so far as the parhypate was a leading-note subject to attraction by hypate (as the leading-note of our major scale is subject to attraction upwards towards the tonic), the principle seems reasonable. But we know so little of the real nature of Greek melody that we cannot sum-

- <sup>1</sup> The tempered thirds we tolerate are actually nearer to Plato than to Archytas.
- <sup>2</sup> Note that it is the practical musicians, not any theoretical  $\kappa \alpha \nu \sigma \nu \iota \kappa o t$ , to whom it is ascribed. They tended, he says, to substitute it for the intonation  $\frac{1}{16} \times \frac{9}{8} \times \frac{1}{9}$ . And, as it was used in combination with a tetrachord of  $\frac{28}{27} \times \frac{8}{7} \times \frac{9}{8}$ , we can see clearly one reason why they did so:  $\frac{2}{27} \times \frac{8}{7} \times \frac{9}{8} \times \frac{9}{8} \times \frac{1}{16} \times \frac{9}{8} \times \frac{1}{9}$  in the E mode gives two false fourths and two false fifths; the substitution of  $\frac{2}{2} \frac{6}{16} \times \frac{9}{8} \times \frac{9}{8}$  in the upper tetrachord gives all true fourths and only one false fifth [F-C]. It is also interesting to note that these intona-
- tions of the practical musicians of Ptolemy's time show a complete avoidance of both major and minor thirds, except in the tetrachord for which the ditonal type was substituted!
- <sup>3</sup> Tannery suggests that this is the legacy of some earlier theorist who wished to deny that Aristoxenus' quarter-tone was the smallest melodious interval. It seems to me more likely that he adopts here for the sake of uniformity the principle of division by tripling the terms  $(\frac{1}{16} = \frac{4}{16} = \frac{4}{16} \times \frac{4}{16} = \frac{4}{16} \times \frac{4}{16} = \frac{4}{16} \times \frac{2}{16} \times \frac{4}{16} = \frac{4}{16} \times \frac{4}{16} = \frac{4}{16} \times \frac{4}{16} = \frac{4}{16} \times \frac{4}{16} = \frac{4}{16} \times \frac{2}{16} = \frac{4}{16} \times \frac{4}{16} \times \frac{4}{16} = \frac{4}{16} \times \frac{4}{16} = \frac{4}{16} \times \frac{4}{16} = \frac{4}$

marily dismiss the  $\frac{28}{27}$  interval that Archytas places in the lower position, and we shall later see reason to relate it to other information we possess.

Diatonic.—As the chromatic nuances of Aristoxenus present points of particular difficulty we will pass straight to the diatonic. If our interpretation of the enharmonic is correct it carries important implications for the diatonic. For us this enharmonic has in the strict sense the δίτονος λιχανός. A comma higher comes the lichanos of Archytas' enharmonic. To this Aristoxenus refers, but does not take it as one of his types, partly perhaps because he disliked the school of Archytas (he was, by all accounts, a maliciously-minded person), more probably because he could not reduce it to such fractions as seemed to him intelligible. The smaller intervals of his system are the quarter- and third- tones; the interval of three-eighths of a tone only enters it  $qu\hat{a}$  one and a half times the quarter-tone, and even in that nuance the lichanos, the important note, is three-quarters of a tone above  $v\pi \dot{\alpha} \tau \eta$ . He might have represented the pycnon of Archytas by seven-twelfths of a tone, but he would not have considered it γνώριμον. However, that he did distinguish his own enharmonic from that of Archytas shows that he was aware of the comma difference, and makes it therefore unlikely that he would fail to distinguish a major from a minor tone if he wished to represent a diatonic scale which combined the two. Actually the varieties of diatonic in Aristoxenus are as follows:

(1) 
$$\frac{1}{2} + 1 + 1$$
 (100 + 199 + 199). (2)  $\frac{1}{2} + \frac{3}{4} + 1\frac{1}{4}$  (100 + 149 + 249). (3)  $\frac{1}{3} + 1\frac{1}{6} + 1$  (66 + 233 + 199). [And perhaps (4)  $\frac{3}{8} + 1\frac{1}{8} + 1$  (75 + 224 + 199).]

Let us set against them the evaluations of the mathematical theorists. (a) First we have the scale of the Timaeus and the κανονικοί, which is also that of Eratosthenes and Boethius and employed under certain circumstances by the professional string-players of Ptolemy's day:  $\frac{256}{243} \times \frac{9}{8} \times \frac{9}{8}$  (90 + 204 + 204). (b) Didymus and Ptolemy ( $\sigma \dot{\nu} \nu \tau \sigma \nu \sigma \nu$ ) both give us a diatonic consisting of major and minor tones and a major semitone. Ptolemy's is as follows:  $\frac{16}{15} \times \frac{9}{8} \times \frac{10}{9}$  (112+204+182); Didymus has the tones in reverse order. (c) Archytas and Ptolemy (τονιαΐον) both have a diatonic containing a septimal tone:  $\frac{28}{47} \times \frac{8}{7} \times \frac{9}{8}$  (63 + 231 + 204). (d), (e) Ptolemy gives us two further varieties, a soft diatonic:  $\frac{21}{20} \times \frac{10}{9} \times \frac{8}{7}$  (85+182+231) and the curious  $\delta \mu \alpha \lambda \delta \nu$ :  $\frac{12}{11} \times \frac{10}{10} \times \frac{10}{9}$  (151+165+182). Now if we take Aristoxenus' enharmonic as equivalent to a pycnon of  $\frac{256}{243}$  plus a strict ditone, we are bound also to take his diatonic (1) as the equivalent of the scale of the Timaeus; for he expressly states that the lichanos of the one is the parhypate of the other. Where then is that variety in the size of the tones that we find in the other computations? Above all, where is the minor tone  $(\frac{10}{9})$  that we find in our own 'just' intonation? If nowhere else, do we not find here a kind of 'temperament' in Aristoxenus, by which a perfect fourth consists of a major semitone and two equal 'tempered' tones? This is the view of Tannery (l.c.), and it is superficially attractive. But it is inconsistent even with such evidence as we have in favour of 'temperament' in Aristoxenus. It is inconsistent with his view that the tone is a magnitude that can be obtained by subtracting the fourth from the fifth. Tone, ditone and semitone are all intervals which he believed could be found by the process of  $\lambda \hat{\eta} \psi_{is}$   $\delta i \hat{\alpha} \sigma v \mu \phi \omega v i \alpha s$ , so that any tempering that was contemplated must also apply to the consonances. The most that could be said is that he failed to distinguish, or turned a blind eye upon, the comma difference between major and minor The likelihood of this depends upon the general degree of accuracy shown in all his computations; and judgement should thus be suspended until we have them all under review. But at least the absence of variety of tones cannot be adduced as evidence, unless the nature of Aristoxenus' system is misunderstood. His nuances are not exclusive but representative types. Quite apart from the soft diatonic (2), of which consideration must be postponed, he does in effect admit a variety of diatonic containing unequal tones.

The intervals of his diatonic (3) are, expressed in cents, 66+233+199. Those of Archytas' diatonic (c) are 63+231+204. The discrepancy is minute. It is surely impossible to doubt that the diatonic Aristoxenus had in mind was that of Archytas, and that it was in general practical use. Any doubt of its practicality would be set at rest by the discovery that Ptolemy not only records it but regards it as the most fundamental type of diatonic, and declares that the artists of his day only used the other intonations in combination with it, a tetrachord of each. This, then, is a most interesting fact about Greek music that alike in the fourth century B.C. and the second century A.D. the Greeks used a diatonic scale containing septimal tones  $\binom{8}{1}$ .

There remains unmentioned by Aristoxenus the type (b), our 'just' diatonic, the σύντονον of Ptolemy, with the variation of it that occurs in Didymus. If Aristoxenus could speak of an enharmonic lichanos which, compared with the δίτονος λιχανός, was μικρφ συντονωτέρα, he could equally well have spoken of a diatonic παρυπάτη that was similarly slightly raised. He does not, and various causes may have led him not to do so. As in the case of the enharmonic, the resulting intervals cannot be expressed in the fractions he favours; and there was no necessity for him to mention varieties to him anomalous, unless he had either a point to make as in the case of diatonic (3) or a grievance to air as in the case of the enharmonic. But perhaps it weighed more with him that such an admission would have disorganized his theory of the loci of lichanos and parhypate. To admit a lichanos higher than the lowest lichanos was simple, but to have a parhypate wandering by however small an interval into the locus reserved for λιχανοί would never do. The loci might meet at a point but not overlap. Thus, if he was aware of a kind of diatonic in which this took place, he has suppressed it—or else it is impossible to extract any consistent sense out of his doctrine. But it is not certain that our normal diatonic (or that of Didymus) was in common use at that time, and it may well have been that when the citharodes had turned their instruments to the ditonal scale the intonation to which they adjusted them, if at all, was that which was obtained by slackening the  $\pi a \rho v \pi a \tau o \epsilon \iota \delta \hat{\eta}$ only to obtain a septimal tone from the  $\lambda \iota \chi \alpha \nu \circ \epsilon \iota \delta \hat{\eta}$ . The evidence of Archytas is strong. We must now see what bearing it has upon the even harder problems of the chromatic nuances.

Chromatic.—Aristoxenus gives three types: (a) μαλακόν  $\frac{1}{3} + \frac{1}{3} + 1\frac{5}{6}$  (66 + 66 + 366), (b) ἡμιόλιον  $\frac{3}{8} + \frac{3}{8} + 1\frac{3}{4}$  (75 + 75 + 348), (c) τονιαῖον  $\frac{1}{2} + \frac{1}{2} + 1\frac{1}{2}$  (100 + 100 + 298); and we may here consider also (d) the soft diatonic:  $\frac{1}{2} + \frac{3}{4} + 1\frac{1}{4}$  (100 + 149 + 249). The mathematical theorists give us two types in which the pycnon is a minor and a major tone respectively. Into the first class fall: (i) Eratosthenes— $\frac{20}{19} \times \frac{19}{18} \times \frac{6}{6}$  (89 + 93 + 316; (ii) Didymus— $\frac{16}{15} \times \frac{25}{24} \times \frac{6}{6}$  (112 + 70 + 316); (iii) Ptolemy (μαλακόν)— $\frac{28}{27} \times \frac{15}{14} \times \frac{6}{5}$  (63 + 119 + 316). Into the second fall those κανονικοί who made the pycnon consist of leimma + apotome, the latter being the difference between the tone and the leimma (cf. Gaudentius, p. 343, Jan), the pseudo-Philolaus, who split the difference between leimma and apotome without attempting a mathematical evaluation, and (iv) Archytas:  $\frac{28}{27} \times \frac{243}{24} \times \frac{32}{27}$  (63 + 141 + 294).

Let us consider Aristoxenus' (c) first. Does its pycnon of a tone represent the 182 cents of Eratosthenes or the 204 cents of Archytas? The difference is less than a comma in either case, but it is definitely nearer to that of Archytas. Further, the fact that Archytas prefers the above formula with clumsy ratios that are not of the favoured type to the simpler  $\frac{2.8}{2.7} \times \frac{1.5}{1.4} \times \frac{6}{5}$  would seem to indicate that the major-tonal pycnon was favoured in contemporary practice. But Aristoxenus differs from Archytas in the division of the pycnon by giving it equal intervals. His parhypate is that

<sup>1</sup> The nearest approach to these equal semitones in mathematical dress is to be found in divides the tone as follows:  $\frac{9}{8} = \frac{18}{17} \times \frac{17}{16}$ .

of the diatonic, so that, if that gave a leimma to hypate, it gave an apotome to lichanos here. The difference is the 'Pythagorean comma' of 24 cents. It seems likely that this difference between two consecutive small intervals was neglected by Aristoxenus, while he was aware of a slightly smaller difference in two rival tunings of the same string, comparison being obviously more difficult in the former case. This is the nearest to equal division of the major tone that makes musical sense. But we must also call to mind that Aristoxenus regarded all the παρυπάται above the enharmonic as common to all chromatic and diatonic λιχανοί, and gave as an example of a melodically satisfactory combination: (e)  $\frac{1}{3} + \frac{2}{3} + 1\frac{1}{3}$  (66 + 133 + 299). Compare this with Archytas' chromatic: 63+141+294. The maximum difference is one of 8 cents, that is, practically negligible. Just, then, as we discovered Archytas' diatonic in Aristoxenus' scheme, so now we have also found his chromatic. This agreement is surely very significant. We can hardly avoid the conclusion that in the τονιαΐον χρώμα also Aristoxenus' tone is the major tone. Before we pass on to the chromatics of lower lichanos, we may note that none of Aristoxenus' evaluations corresponds closely to the chromatics of Eratosthenes, Didymus and Ptolemy (soft). I find it easier to believe that this reflects the practice of his time than that he either failed to recognize the distinction between major and minor tones or deliberately adopted a compromise between them.

There remain the two lower chromatics, (a)  $\mu a \lambda a \kappa \acute{o} \nu$  and (b)  $\dot{\eta} \mu \iota \acute{o} \lambda \iota o \nu$ , and the soft diatonic. I cannot pretend to solve the problems that arise when we try to interpret them in terms of musical practice. I have, however, various suggestions to make. The first point that is remarkable is the extraordinary closeness between the two chromatics, which Aristoxenus yet thought it worth while to record as distinct types. Even between the respective  $\lambda \iota \chi a \nu o \acute{\iota}$  of (a) and (b) there is only a difference of 18 cents, less than a comma; that between the  $\pi a \rho \nu \pi \acute{a} \tau a \iota$  is only half as much. We must, however, keep in the forefront of our minds that Aristoxenus was not wedded to equal division of the pycnon in the chromatic but regarded the various  $\pi a \rho \nu \pi \acute{a} \tau a \iota$  as common; we must then examine all the values involved independently as well as in combination.

First we should consider a theory advanced by Tannery in an article published posthumously ('Sur le spondiasme dans l'ancienne musique grecque,' Rev. archéol., 1911, Vol. I, pp. 41-50 = Mém. Scient. III, 299-309). There he attempts to identify the soft chromatic lichanos with that of Archytas' enharmonic and the hemiolic lichanos with that of the chromatic of Eratosthenes. Thus two-thirds of a tone represents  $\frac{16}{15}$ , three-quarters of a tone represents the minor tone  $\frac{10}{9}$ ; and it is pointed out that the minor-tonal pycnon of the hemiolic type is very nearly one and a half times the major semitone  $\frac{16}{15}$ . There are then, in effect, only four upper intervals in enharmonic and chromatic nuances  $(\frac{81}{64}, \frac{6}{4}, \frac{6}{6}, \frac{32}{27})$ , and the four types of Aristoxenus are inaccurate interpretations of them. The conclusion would be a satisfying one if we could feel it was honestly come by. But there are objections. In the first place the hemiolic lichanos of Aristoxenus is one and a half times not his soft chromatic but his enharmonic lichanos; 182 cents is near enough to being one and a half times 112 cents; but in the case of 182 and 90 the error is too great. That is to say, Tannery's interpretations of the two chromatics are mutually inconsistent. There are also difficulties about each taken separately. The equation of two-thirds of a tone with 16 involves an error of about a comma; it therefore just doubles the true difference between  $\frac{256}{243}$  and  $\frac{16}{15}$ . The equation of three-quarters of a tone with  $\frac{10}{9}$  involves the still larger error of 32 cents. Further, whatever three-quarters of a tone means here, it presumably means the same also in the soft diatonic, where it occurs as the middle

<sup>1</sup> Similarly, the minor tone can be divided with approximate equality, as by Eratosthenes; but it is the division of Didymus that gives the more convincing intervals.

interval. The mathematicians give us two evaluations with a minor tone in this position—Didymus' diatonic:  $\frac{16}{15} \times \frac{10}{9} \times \frac{9}{8}$  (112+182+204) and Ptolemy's soft diatonic:  $\frac{21}{20} \times \frac{10}{9} \times \frac{8}{7}$  (85+182+231). Aristoxenus' 100+149+249 can scarcely be intended for the former, since 100 cents absurdly misrepresents the difference between the two tones.¹ The latter is more plausible, granted the error of 33 cents; but we can find a closer parallel than this to Aristoxenus' soft diatonic in Ptolemy.

Let us return to the soft chromatic of Aristoxenus. Its parhypate is a third-tone above  $i\pi i \pi \eta$ , its lichanos two-thirds of a tone. But with the interval of a third-tone we are already familiar and have seen reason to equate it with the ratio of  $\frac{28}{27}$  occurring in Archytas' chromatic and diatonic. This would seem to be a fixed point. But if we have found parhypate, we are far from finding lichanos. The nearest interval to two-thirds of a tone that we can find among the mathematicians is Archytas'  $\frac{243}{224}$ . But this gives us an incredible top interval for the tetrachord, consisting of the combination of a minor tone, a major semitone and Archytas' third-tone. The major third is 20 cents larger, but must belong either to Aristoxenus' enharmonic or to that variant of it that is expressly distinguished from the chromatic. There is in fact no musically probable interval that can be held to be represented by the top interval of this tetrachord and yet distinguished from that of the hemiolic chromatic. I suggest that Aristoxenus, favouring the equal division of pycna, and knowing his third-tone  $(\frac{28}{27})$  to be a true musical interval, assumed that by doubling it he could obtain a satisfactory lichanos, and so produced a completely factitious nuance.

The hemiolic chromatic and soft diatonic alike contain the interval of threequarters of a tone, the former as pycnon, the latter as middle interval. The interval is also known to us as σπονδειασμός, both from pseudo-Plutarch de mus. § 112 (Weil and Reinach) and from Aristides Quintilianus, p. 28 (Meibom). It was employed apparently in the old Spondeion scale for the undivided 'pycnon' in the upper (and presumably also in the lower) tetrachord, instead of the semitone of the enharmonic pycnon or lowest diatonic interval. Tannery, as we have seen, interprets this three-quarter tone as the minor tone. But there is a musical interval occurring in Ptolemy's tetrachords that is far closer in value. Three-quarters of a tone is worth 148 cents, and the interval of  $\frac{12}{11}$  is worth 151. The latter occurs as the lowest interval of Ptolemy's δμαλον διάτονον. Whatever may be the truth about this peculiarlooking tetrachord  $(\frac{12}{11} \times \frac{11}{10} \times \frac{10}{9})$ , it is unlikely to have been pure invention of Ptolemy, and it would seem to have relation to the Spondeion. If the 'lichanos' of the Spondeion was  $\frac{12}{11}$  above the hypate, did it remain so when in the course of development the pycnon was divided? If so, into what intervals was it divided? These questions cannot be answered with certainty.  $\frac{24}{23} \times \frac{23}{22}$  would merely give the familiar fiction of equal division. The musical interval nearest in value to Aristoxenus' threeeighths of a tone (75 cents) is our own minor semitone  $\frac{25}{24}$  (70 cents), which occurs as the middle interval of Didymus' chromatic, but it will not conveniently combine in a tetrachord with an upper interval of  $\frac{11}{9}$ . Perhaps we must here, as in the soft chromatic, consider the validity of parhypate and lichanos separately, and regard the intervals of a minor semitone and an undecimal three-quarter tone as both familiar to Aristoxenus from actual practice, but their combination in a single nuance as factitious.

with the account in Plutarch, which demands the possibility of confusion between the upper interval of the lower tetrachord (F-A) and the combination of disjunctive tone and  $\sigma\pi\sigma\nu\delta\epsilon\iota\alpha\sigma\mu\delta s$  (A-C).  $\frac{12}{11}$  as  $\sigma\pi\sigma\nu\delta\epsilon\iota\alpha\sigma\mu\delta s$  makes these intervals practically identical. On this point, and on the Spondeion in general, I would refer the reader to my article on 'The Spondeion Scale' in C.Q., Vol. XXII, 1928.

<sup>&</sup>lt;sup>1</sup> If Aristoxenus wished to represent this type of diatonic and was taking  $^{1}0^{0}$  as three-quarters of a tone, he was faced by a dilemma. Either he must grotesquely exaggerate the difference of the tones, as above, or, representing the major tone, as usual, by his own whole tone, make the lowest interval also three-quarters of a tone, which is absurd.

<sup>&</sup>lt;sup>2</sup> The interval of <sup>10</sup>/<sub>9</sub> will not really square

This same interval of the three-quarter tone occurs also in the soft diatonic of Aristoxenus. This tetrachordal division assumes the possibility of dividing the fourth into two equal parts, each  $1\frac{1}{4}$  tones in size. The division of the fourth  $(\frac{4}{3})$  into simple ratios which comes nearest to this is  $\frac{8}{7} \times \frac{7}{6}$  (231 + 267). Aristoxenus'  $1\frac{1}{4}$  tones (249) lie exactly half-way between these two ratios. But it would be somewhat in favour of equating the upper interval of his soft diatonic with  $\frac{7}{6}$  that elsewhere he appears to represent Archytas'  $\frac{8}{7}$  by the interval of  $1\frac{1}{6}$  tones. On the basis of the above division Ptolemy constructs two tetrachords, his soft diatonic  $\frac{21}{20} \times \frac{10}{9} \times \frac{8}{7} (85 + 182 + 231)$  and his  $\sigma \dot{\nu} \nu \tau \sigma \nu \sigma \nu \chi \rho \hat{\omega} \mu \alpha = \frac{22}{21} \times \frac{12}{11} \times \frac{7}{6}$  (80 + 151 + 267). If we compare Aristoxenus' soft diatonic with these we find that in the former case, which sets three-quarters of a tone against the minor tone (as on Tannery's hypothesis), the maximum error is the large one of 33 cents, in the latter it is less than a comma; the middle intervals are practically identical, the semitone, which in the enharmonic represented 90 cents, is here 80, the upper interval of  $1\frac{1}{4}$  tones represents the septimal third  $\frac{7}{6}$ . This last interval shows a divergence of 18 cents, yet I hope to show that it is really the strongest possible reason for equating Aristoxenus' soft diatonic with Ptolemy's σύντονον χρωμα. For the part played by this septimal minor third in Greek music has not yet been fully recognized.

The soft diatonic nuance of Aristoxenus is not the only place in Greek musical theory where the interval of  $1\frac{1}{4}$  tones is mentioned. Two theorists (both perhaps depending ultimately on Aristoxenus) mention the term  $\tilde{\epsilon}\kappa\beta\delta\lambda\eta$  and define it as a rising interval of five dieses, or quarter-tones. These are Aristides Quintilianus and Bacchius. It is also mentioned, without definition, in pseudo-Plutarch, de musica.

- (a) Aristides Quintilianus inserts between his accounts of Modulation and Melodic Composition (p. 28) a brief description of three intervals, namely:  $\tilde{\epsilon}\kappa\lambda\nu\sigma\iota s$ , a fall of three dieses;  $\sigma\pi\sigma\nu\delta\epsilon\iota a\sigma\mu\delta s$ , a rise of three dieses; and  $\tilde{\epsilon}\kappa\beta\delta\lambda\eta$ , a rise of five dieses. These intervals had to be employed, he says, by the ancients  $\pi\rho\delta s$   $\tau\delta s$   $\delta\iota a\phi\rho\rho\delta s$   $\delta\iota a\phi\rho\rho\delta s$   $\delta\iota a\sigma\tau\eta\mu\delta \tau\omega\nu$  (whatever that may mean) owing to the rarity of their employment. They are, then, connected in some way with the old  $\delta\rho\mu o\nu\delta s$ .
- (b) Bacchius §§ 41, 42 defines ἔκλυσις and ἐκβολή similarly, using the phrase ἀπό τινος φθόγγου ἀρμονίας, where ἀρμονία might perhaps mean 'scale,' though in the only other place where the word occurs in Bacchius it means 'enharmonic.' (That he illustrates the intervals from that part of the scale in which the tetrachords συνημμένων and διεξευγμένων overlap is probably because this offered the only opportunity of illustrating the interval of three dieses.) In an earlier passage, however (§§ 36, 37), he definitely associates them with the enharmonic. After distinguishing between 'standing' and 'movable' notes, he adds to the definition of the latter class the remark 'δι' ὧν τὰ διαστήματα πάντα ἀνίεται καὶ ἐπιτείνεται πλὴν δύο. The catechism continues. 'Which are these?' 'ἔκλυσις and ἐκβολή.' 'How is this?' 'ἔκλυσις is a fall in pitch, ἐκβολή a rise in pitch.' 'In what genus?' 'In the enharmonic and in no other.'
- (c) The pseudo-Plutarch passage (§ 287) associates  $\epsilon \kappa \beta o \lambda \eta$  and  $\epsilon \kappa \lambda v \sigma \iota s$  with Polymnestus and may ascribe to him their 'invention' (the reading is doubtful).<sup>2</sup>
- <sup>1</sup> If this equation is correct, we have the interesting fact that the only type of chromatic that Ptolemy found in practical use in his time was actually regarded by Aristoxenus as diatonic!
- <sup>2</sup> καὶ τὴν ἔκλυσιν καὶ τὴν ἐκβολὴν πολὺ μείζω πεποιηκέναι φασὶν αὐτόν. πολὺ μείζω certainly makes bad sense, and Reinach brackets it as concealing a marginal Πολύμνηστον or Πολύμνιστον and translates πεποιηκέναι by 'il créa.' But εὐρίσκω (or some compound) is usual in

pseudo-Plutarch of musical 'inventions,' and I prefer Westphal's hypothesis of a lacuna after  $\dot{\epsilon}\kappa\beta$ ολ $\dot{\eta}\nu$ ; these accusatives then are constructed with Πολυμνήστ $\omega$ ...  $\dot{\alpha}\nu\alpha\tau\iota\theta\dot{\epsilon}\alpha\sigma\iota$  in the preceding phrase. It is conceivable that, just as Terpander is associated with the employment in melody of Dorian  $\nu\dot{\eta}\tau\eta$ , so Polymnestus popularized the addition of D below an enharmonic E octave. See below.

It must be confessed that our authorities are unsatisfactory. Bacchius is very incoherent. Can any intervals except the fourths and fifths of the harmonic framework (E-A-B-E) and the disjunctive tone be said to be independent of the movements of the 'movable' notes? But it seems that he is trying to distinguish these intervals from the normal mutations within the tetrachord. I believe that the clue to  $\epsilon κ eta ο \lambda \eta$ at least is to be found in the disjunctive tone and also in the tone between  $b\pi a \tau \eta$  and the note a tone below ὑπάτη (Aristides and Theo Smyrnaeus give us the convenient term  $\dot{v}$ περυπάτη). This interval is found combined with an enharmonic pycnon in the old ἀρμονίαι described by Aristides (p. 21) and also in the Orestes fragment. There we twice find an instance of the progression P  $\Phi$ , namely from enharmonic  $\pi \alpha \rho \nu \pi \acute{\alpha} \tau \eta$ to diatonic  $\lambda_i \chi \alpha \nu \delta_s$  ὑπατῶν (or ὑπερυπάτη)—an interval, that is, of five dieses. These tones, both, it will be noted, outside the tetrachordal variation, offer no clue to intervals of three dieses; and σπονδειασμός must certainly be associated, on the strength of pseudo-Plutarch's evidence, with the lower interval of the Spondeion trichord. It will have been remarked that the intervals quoted from the Orestes fragment are falls, not rises, of five dieses. Why is the term  $\sigma \pi o \nu \delta \epsilon \iota a \sigma \mu \delta s$  limited to a rise of three dieses? If ἔκλυσις is to be taken as its corresponding fall, it is thereby divorced from ἐκβολή. Was there no name for a fall of five dieses? It is hard to believe that the account of these intervals has come down to us aright. It seems to me at least credible that there has been a confusion here and that σπονδειασμός meant a rise or fall of three dieses and was associated with the Spondeion scale, while ἔκλυσις and ἐκβολή were respectively a fall and rise of five dieses.

However this may be, there is evidence (including that of an actual musical document) for an interval of five dieses, called into being through the relation of the enharmonic pycnon and a tone (unaffected by the genera) lying immediately below it. Now, the employment of such an interval may or may not have been rare, as Aristides says; but in any case it is likely that it was some comparatively simple musical interval and not the result of a haphazard approximate splitting of a semitone. Indeed such an interpretation of the enharmonic pycnon is only possible if we imagine the  $\mu\epsilon\sigma\delta\pi\nu\kappa\nu\nu\nu$  to have been employed merely in relation to the extremes as a 'Durchschleifen durch das Intervall,' as Westphal puts it. It is one of the great values of the Orestes fragment for us that it shows us that this was not so. Now, there are only two intervals smaller than the major semitone  $(\frac{16}{15})$  which will make with the tone below a satisfactory interval. One is  $\frac{64}{63}$ , which makes with the major tone  $(\frac{9}{8})$  the septimal tone  $(\frac{8}{7})$ . But this is smaller (27 cents) than any interval which we can postulate for Greek music.<sup>2</sup> The other is  $\frac{28}{27}$ , which with the tone makes the septimal third  $\frac{7}{6}$ .

Perhaps we can now see why Archytas selected  $\frac{28}{27}$  to give the common parhypate of his three genera. As Tannery points out, to understand his ratios it is necessary to consider not only the typical tetrachord (E-A) but also the tone below (D-E). For he obtained his enharmonic lichanos by dividing the fifth (D-A) into

the intonation at will, varied the pitch of the enharmonic parhypate according as it was employed in relation to hypate or to hyperhypate. If then in the course of the same piece he made the interval between hyperhypate and parhypate that of  $\frac{7}{6}$  and also employed the lichanos of Aristoxenus, a leimma above hypate, he would in effect be employing two notes distant only by  $\frac{6}{6}$ . Procedure of this sort might also have led Aristoxenus to evaluate  $\frac{7}{6}$  ( $=\frac{9}{8} \times \frac{2}{2}$ ) as  $1\frac{1}{4}$  tones (see p. 207), which an interval of  $\frac{9}{8}$  ( $=\frac{9}{8} \times \frac{6}{6}\frac{4}{3}$ ) between hyperhypate and parhypate would not do, as that he elsewhere equates with  $1\frac{1}{6}$  tones.

<sup>&</sup>lt;sup>1</sup> It is found also in the second Delphic Hymn, but there the pycnon is more probably chromatic.

<sup>&</sup>lt;sup>2</sup> This interval is the difference between the septimal tone  $\binom{8}{7}$  and the major tone  $\binom{9}{8}$ . It plays an important part in the theories of Dr. W. Perrett (Some Questions of Musical Theory, 1926 and 1928). Though I find difficulty in accepting them in detail, I believe with him that the Greeks used intervals strange to us with precision. They can scarcely, however, have used so small an interval as 27 cents. It is possible that the aulos-player, who could control

 $\frac{6}{5} \times \frac{5}{4}$ ; and, having fixed his diatonic lichanos a major tone from A, he divides the fourth (D-G) into  $\frac{7}{6} \times \frac{8}{7}$  and so finds his common parhypate a septimal third above D and the interval of  $\frac{28}{27}$  above E. This was no mere mathematical trick. If we are to believe the evidence, he was making a genuine attempt to interpret the actual facts of music, and the criticisms of Ptolemy arise in part from Ptolemy's ignorance. Archytas is in a fair way towards being justified in every department. His diatonic and his chromatic are found to square with tetrachordal divisions admitted melodious by Aristoxenus. His enharmonic lichanos appears to be that higher enharmonic lichanos that so roused Aristoxenus' ire, while now his parhypate is seen to give with the  $i\pi\epsilon\rho\nu\pi\acute{a}\tau\eta$  (or, in the upper tetrachord, with  $\mu\acute{\epsilon}\sigma\eta$ ), an interval which may have been of great importance in the genuine enharmonic music of ancient Greece (an interval which, it may be added, is produced also by his diatonic, which is also Ptolemy's staple diatonic; it is thus the only type of third which occurs freely in the lyre and cithara scales of Ptolemy). Finally, we may add that what is Archytas' justification is also perhaps the explanation of a peculiarity of the notations that has often been remarked, the fact that parhypate in all genera, including the diatonic, is indicated by the same alphabetic sign.

An obvious inconsistency will have occurred to the reader. Έκ $\beta$ ολ $\dot{\gamma}$  is evaluated at five dieses. Similarly the highest interval of the soft diatonic of Aristoxenus is a tone and a quarter. I have been interpreting this as equivalent to the interval of the septimal third  $(\frac{7}{6})$ , which occurs in Archytas' system as the product of a major tone and the small septimal semitone  $(\frac{28}{27})$ . But in the discussion of the chromatic and diatonic nuances this same semitone has been taken to be equal to Aristoxenus' third-tone. The distinction is small, whatever Aristoxenus meant by his quartertone, but still Aristoxenus makes it. In strict consistency, then,  $\frac{7}{6}$  should appear in Aristoxenus' system as  $1\frac{1}{3}$  tones. He should, for instance, have evaluated his soft diatonic:  $\frac{5}{12} + \frac{3}{4} + 1\frac{1}{3}$ , which would then have corresponded exactly with Ptolemy's σύντονον χρώμα. To this may be replied that he would not countenance  $\frac{5}{12}$  in his scheme any more than  $\frac{7}{12}$  for the higher enharmonic pycnon. To the contention that he ought to have evaluated the  $\epsilon \kappa \beta_0 \lambda \dot{\eta}$  as  $1\frac{1}{3}$  I can only reply that he was determined that his enharmonic should have quarter-tones, that he knew the  $\tilde{\epsilon}\kappa\beta$ o $\lambda\dot{\eta}$  was an enharmonic interval, that he hoped and believed it was represented by a tone plus his enharmonic diesis, and that he was convinced that the lowest interval of a tetrachord was never larger than the middle one.

If we can, then, equate Aristoxenus' soft diatonic with Ptolemy's σύντονον χρωμα with a high degree of probability, does Ptolemy's own soft diatonic,  $\frac{21}{20} \times \frac{10}{9} \times \frac{8}{7}$ (85+182+231), find no reference in Aristoxenus? Not, clearly, in his system of nuances. But there is a difficult passage in pseudo-Plutarch de mus. (§§ 394-407) which I think provides a mention of it. The speaker (and his authority is almost certainly Aristoxenus), answering the objection that the enharmonic quarter-tone, which he is defending, cannot be obtained by means of the consonances, turns the tables on his opponents by remarking that this objection applies equally to the intervals also which consist of an odd number of dieses. Now, they themselves prefer to employ tetrachordal divisions in which the intervals are for the most part either odd or irrational; for they are continually lowering (μαλάττουσι) the λιχανοί and  $\pi a \rho a v \hat{\eta} \tau a \iota$ . (The continuation raises a fresh problem of considerable difficulty which is not relevant here.) In what genus did this lowering of lichanos take place? Not in the enharmonic, for it is the raising of lichanos that he cavils at there. More likely it is in the diatonic. The σύντονον diatonic for all theorists except Ptolemy has as its upper interval a major tone. The popular tendency was to lower the lichanos and produce a 'soft' diatonic. This could be done in two ways, by substituting for the tone  $\binom{9}{9}$  either the septimal tone  $\binom{8}{7}$  or the septimal third  $\binom{7}{6}$ . In the latter case there resulted what Ptolemy called a σύντονον chromatic and Aristoxenus

a 'soft' diatonic, of which the two upper intervals were three and five dieses, that is to say  $\pi\epsilon\rho\iota\tau\tau\acute{a}$ . In the former case there resulted Ptolemy's 'soft' diatonic. Now the highest interval of this is in Aristoxenian language  $i\frac{1}{6}$  tones, and this is an irrational interval (on any possible theory of that debatable term which is consistent with the evidence of the fragment on Rhythm).

This article must have seemed to the reader a mass of hypotheses, some more plausible, some less. No one is more conscious than the writer of the number of loose ends that remain. This was inevitable in dealing with such an unscientific author as Aristoxenus. But it seemed to me worth while to attempt to extract musical sense from his simple arithmetic; and in some cases, notably his implied admission of the diatonic and chromatic of Archytas, the sense appears to be so good that it creates a certain presumption that his other dicta are not wholly nonsensical. The acceptance of Archytas' ratios means in effect the acceptance of the seventh harmonic as an important element in Greek music. What is more likely to provoke opposition is the use of the eleventh harmonic to explain the three-quarter-tone interval (the musical probabilities are hard to estimate); and some may prefer, despite the difficulties I have mentioned, to find in it the minor tone and so equate the ἡμιόλιον χρώμα of Aristoxenus with the chromatic of Eratosthenes, his soft diatonic with Ptolemy's soft diatonic. In any case the absence of this latter interval from the above interpretation of Aristoxenus' nuances is a serious matter. Rather, however, than find it in the three-quarter-tone, I would believe that it has been lost by attempting to ascribe too great accuracy to the author. The τονιαΐον χρωμα is a crucial case. Evaluated in cents it comes closer to the type with a major tone in the pycnon than to that with a minor tone. But it must be noted that twice Aristoxenus' leimma-semitone is almost exactly a minor tone. It is conceivable that the upper interval of this tetrachord may represent not only  $\frac{32}{27}$  but  $\frac{6}{5}$ ; that in the latter case its pycnon may, on the principle of common παρυπάται, have been divided into a major and a minor semitone (though on Aristoxenus' principles it would have been in the reverse order to Didymus). It is conceivable that he intended his σύντονον diatonic to represent either the ditonal diatonic or that with a major and a minor tone (probably in Didymus' rather than Ptolemy's order). He may in either case have disregarded the difference of a comma. But I have already stated why I find it hard to believe that the theorist who was agitated by the raising of the enharmonic lichanos by that interval (and how else can the συντονωτέρα λιχανός be interpreted?) disregarded that difference everywhere else. I could believe more easily that he deliberately banished the minor tone from his system along with the major semitone because he could not express them in simple enough fractions, because they were associated with the enharmonic lichanos he deplored, because they disarranged his theory of the loci of parhypate and lichanos. It may even be the case—and this hypothesis would save both the appearances and the reputation of Aristoxenusthat the minor tone was not in fact an interval in common use in this period of Greek music; that the harsh thirds of the ditonal scale, which were sweetened in the enharmonic by substituting the major third, were habitually modified in the diatonic by an alteration in the other direction to give the large septimal third  $(\frac{9}{7} = \frac{8}{7} \times \frac{9}{8})$ .

However that may be, the chief service of Aristoxenus' account of the genera seems, on examination, to be the confirmation of Archytas.

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1 Aristoxenus' remarks upon the lowering of lichanos here and his polemic against its raising in the enharmonic combine to show the primary importance of this string in determining genus and nuance. As for the two lowest intervals, those of Ptolemy's tetrachord might be expressed

as  $\frac{5}{12}$  and  $\frac{11}{12}$  of a tone, and would thus both be irrational. It would be possible to fill up the tetrachord also with  $\frac{28}{27} \times \frac{9}{8}$ , that is to say  $\frac{1}{3} + 1$ , intervals more familiar to Aristoxenus. But this has no independent support.



Further Notes on Aristoxenus and Musical Intervals

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# FURTHER NOTES ON ARISTOXENUS AND MUSICAL INTERVALS.

The 'Aρμονικὰ Στοιχεῖα of Aristoxenus, being the earliest treatise on Greek Music extant, have hitherto held an unchallenged position as the foundation of much of our knowledge of ancient musical theory. Mr. R. P. Winnington-Ingram's shrewd and critical examination (C.Q. XXVI, 195 ff.) of the many difficulties involved in Aristoxenus' treatment of subtleties of intonation is a very welcome contribution to a thorny subject; and it is in the hope of furthering our understanding that I venture to offer these comments on one or two points where alternatives or modifications may be suggested.

Aristoxenus did not employ ratios as a means of determining the value of musical intervals, but relied upon the judgement of his ear. He elected to use an imaginary unit of measurement, viz. one-twelfth of a tone, which he could not produce or teach with precision and accuracy in theory or practice by any method available in his day. He makes no mention of the monochord, which alone afforded an avenue to the scientific determination of intervals. Discrepancies in his findings are, therefore, a foregone conclusion.

It would seem advisable under these conditions to come first of all to a decision about the kind of tone Aristoxenus had in mind in his evaluation of intervals. The only tone clearly defined by him is the major tone of ratio  $\frac{9}{8}$ , and on this point his reiterations leave no possible doubt.

The following passage may be cited as an instance:

'A tone is the difference in compass between the first two concords, and may be divided by three lowest denominators, as melody admits of half-tones, thirds of tones and quarter-tones, while undeniably rejecting any interval less than these. Let us designate the smallest of these intervals the smallest Enharmonic diesis, the next the smallest Chromatic diesis, and the greatest a semitone.' 1

Such statements by Aristoxenus make it quite clear that it was the major tone  $(=\frac{9}{8} \text{ or } 204 \text{ cents})^2$  that he had in mind: whatever discrepancies or errors may result from acceptance of the 204 cent tone as working basis must be faced. In his table (p. 198) Mr. Winnington-Ingram has taken a perfect Fourth of 498 cents as the basis of his interpretation and divided it into the Aristoxenian proportions as near as he could. I append his evaluations to those derived from the logical application of Aristoxenus' own unit:

TETRACHORDAL DIVISIONS, WITH EQUIVALENTS IN CENTS.

#### Enharmonic.

$$\frac{1}{4} + \frac{1}{4} + 2$$
 tones = in cents  $5I + 5I + 408 = 510$   
 $50 + 50 + 398 = 498$  (W.-I.)  
Chromatic  $\mu \alpha \lambda \alpha \kappa \delta \nu$ .  
 $\frac{1}{3} + \frac{1}{3} + \frac{1}{6}$  tones = in cents  $68 + 68 + 374 = 510$ 

 $\frac{1}{3} + \frac{1}{3} + 1\frac{6}{6}$  tones = in cents 68 + 68 + 374 = 51066 + 66 + 366 = 498 (W.-I.)

tone = 68 cents, the sixth-tone = 34 cents, the eighth-tone = 25.5 cents, the twelfth-tone = 17 cents, the twenty-fourth tone = 8.5 cents.

Macr., p. 180 (Mb. 21); cf. p. 199 (Mb. 46), p. 207 (Mb. 57), p. 211 (Mb. 62).

Thus one tone=204 cents, the half-tone=
102 cents, the quarter-tone=51 cents, the third-

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Chromatic ἡμιόλιου.
\frac{3}{8} + \frac{3}{8} + 1\frac{3}{4} \text{ tones} = \text{in cents } 76.5 + 76.5 + 357 = 510
75 + 75 + 348 = 498 \text{ (W.-I.)}
Chromatic τονιαῖου.
\frac{1}{2} + \frac{1}{2} + 1\frac{1}{2} \text{ tones} = \text{in cents } 102 + 102 + 306 = 510
100 + 100 + 298 = 498 \text{ (W.-I.)}
Chromatic (mixed, p. 52 Mb.).
\frac{1}{3} + \frac{2}{3} + 1\frac{1}{2} \text{ tones} = \text{in cents } 68 + 136 + 306 = 510
66 + 133 + 299 = 498 \text{ (W.-I.)}
Diatonic μαλακόυ.
\frac{1}{2} + \frac{3}{4} + 1\frac{1}{4} \text{ tones} = \text{in cents } 102 + 153 + 255 = 510
100 + 149 + 249 = 498 \text{ (W.-I.)}
Diatonic σύντονον.
\frac{1}{2} + 1 + 1 \text{ tones} = \text{in cents } 102 + 204 + 204 = 510
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The vital difference between the literal interpretation of Aristoxenus' standard of valuation and the one given by Mr. Winnington-Ingram is that the former involves an error at the expense of the consonance of the Fourth: every tetrachord is found to be sharpened by 12 cents; in the latter the distortion of the Fourth has been avoided by assuming in its place the distortion, by tempering, of the smaller intervals. Now on the one hand it is incredible that the Fourths should have been distorted; on the other hand the tempering of the smaller intervals would imply the adoption of a standard tone of different value, one for which Aristoxenus provides no definition and (I believe) no implication.

100 + 199 + 199 = 498 (W.-I.)

It was indeed made sufficiently clear by Mr. Winnington-Ingram that he assumed tempering in this instance, not from the conviction that it was an established practice in the day of Aristoxenus, but rather from motives of expediency, in order to find a fitting basis of values that should not entail the violation of the consonance of the Fourth.

Now, while tempering on paper in cents may be adopted by some as a pis-aller, the suggestion that tempered intervals could have been used in the practical music of Ancient Greece must, I think, be rejected on several grounds. There is no possibility of finding a corresponding ratio of length of string or column of air to produce tempered intervals; there was no device in tuning, practicable among the Greeks, that would ensure judging tones of exactly 199 cents or tempered semitones of 100 cents; nor is there any assurance of being able to repeat such intervals at will on any degree of the scale<sup>1</sup>; moreover, if we are to get to the root of the matter, no loose approximation has any prima facie claim to our consideration.

Tempering implies a departure from an established system. Before any suggestion for tempering can be seriously entertained,2 it must be shown that some

<sup>1</sup> In relation to tempering, Erich M. von Hornbostel states 'that the most efficient of our piano tuners, making use of beats for the determination of correct tempering [an aid to the ear due to sympathetic resonance of the strings and their unisons, which is very powerful on the piano but very weak on the Kithara, if not altogether negligible.—K. S.], are wont to make errors of as much as four vibrations per second in the middle octave'—Notiz über die Musik d. Einwohner v. Süd-Neu-Mecklenburg. Abh. z. vergl. Musikwissenschaft. München, 1922, Bd. I., pp. 352-353.

- A. J. Ellis has made similar statements, giving exact results of tests.
- <sup>2</sup> Tempering in relation to Aristoxenus is a theory advanced by the foremost authorities of the French School, viz. A. J. Vincent, Théodore Reinach, Louis Laloy, etc., all of whom have been led to adopt tempering as a solution of the difficulties raised by the error of a comma involved in the method suggested by Aristoxenus (Macr., pp. 207-208; Mb., pp. 56-58) for verifying his assumption that the Fourth consists of two and a half tones.

powerful influence, some urgent practical need or musical development had actually arisen to compel Aristoxenus and the Greeks generally to adopt the expedient of tempering or mistuning intervals, either consciously or unwittingly.

Equal temperament is a system which deliberately denatures and distorts all those intervals within the octave which man has absorbed into his inner consciousness through the ages as natural constituents of the physical basis of sound.

It has yet to be demonstrated that there was any powerful urge in the day of Aristoxenus to demand tempering. It seems evident that neither the strict applicacation of Aristoxenus' own unit nor an interpretation dependent on a kind of tempering will provide a satisfactory account of the intonation in practical use during the period in question. Both those methods are therefore discredited.

The problem that faces us is really more fundamental than appears on the sur-We are certainly concerned with the fact which Mr. Winnington-Ingram points out that, since harmonic or vertical expansion was virtually unknown to the Ancients, the charm, interest and power of music made themselves felt mainly through subtleties of intonation; but such subtleties are meaningless until we apprehend the principles which determine their existence. Our proper quest is not the ability to identify one or another interval or division of the tetrachord, vaguely adumbrated by Aristoxenus, so much as to discover some underlying system to account for these subtleties and unusual intervals, and to trace such a system in place in the historical development of music in Greece. Happily we are not dependent solely upon the theorists for our knowledge of Greek Music: there are the few recovered fragments of hymns in alphabetical notation—the key to which is furnished by the Tables of Alypius—and there are the few surviving Auloi which preserve, in the disposition of their finger-holes, an imperishable record. No system, scale, or interval, can be deemed acceptable as a vital and significant fact in the history of Greek Music which is not corroborated by the Notation of Alypius, with all its implications, and by the testimony obtained from a practical study of the Aulos and its mouthpieces in surviving specimens. Carefully made facsimiles of the Auloi will, I believe, be found to provide a clue to unsolved problems presented by the Greek musical system.

In attempting to identify the Chroai there is an alternative course available as a substitute for the two evaluations mentioned above, which does not entail the violation of the purity of any of the intervals, and which further commends itself by being not merely speculative but a practical reality. This alternative consists in rescuing from oblivion the Harmoniai or Aulos-scales mentioned by Aristoxenus in the slighting terms he adopts tow. In all that emanates from the Harmonists. Concerning these scales, he says: 'Others again, having regard to the boring of finger-holes on the flutes (αὐλοί), assume intervals of three-quarter-tones (τρισὶ διέσεσιν³) between the three lowest Keys, etc.'

If it may here be assumed that the Harmoniai of Greek Music were derived from the Aulos-scales, it is seen that these depart from the tetrachordal system of Aristoxenus, Ptolemy and the Graeco-Roman theorists in that the unit is not the tetrachord but the octave, a fact emphasized on several occasions by Aristoxenus himself. Some of the formulae of the Chroai recorded by Ptolemy are in fact tetrachords of Aulos-scales separated from their context.

- 1 When equal temperament was adopted in the eighteenth century there was a strong inducement or necessity as driving power: it was in order to satisfy the desire for modulation into various tonalities in the face of the prohibitive technical exigencies of musical instruments.
- <sup>2</sup> The system of the Harmonists and the ratios of the Aulos-scales have been identified and

established by well-authenticated evidence in a work which I have in preparation for the Press.

<sup>3</sup> P. 193 (37 Mb.). The translation by Macran of  $\delta l \epsilon \sigma \iota s$  as 'quarter-tone' is not a happy one here, for the diesis had no definite magnitude; it was valued by Aristoxenus merely as something less than a semitone.

=510

The ratios of the modal system of the Harmoniai and the modifications incurred during the Graeco-Roman period suggest that the most important of the shades of the genera, as recorded by Aristoxenus and Ptolemy, were segments of the Perfect Immutable System, and not merely varieties for occasional use. Thus the alternative course in the valuation of the intervals of Greek Music consists in a plea for recognizing in the Chroai of Aristoxenus his attempt to express in his own terms some of the more familiar of the Aulos-scales of the Harmonists, on which were based the ancient  $\delta\rho\mu\nu\nui\alpha\iota$ . Aristoxenus has selected those which have a perfect Fourth and Fifth on the Tonic.

These scales were evidently in high favour with an important section of the musical world of his day, judging from the violence of the polemic which Aristoxenus directs against the Aulos (Mb., pp. 39-43; Macr., pp. 194-197) and against the claim of the Harmonists that this instrument embodies the  $\tau \hat{\eta} \nu \tau o \hat{v} \hat{\eta} \rho \mu o \sigma \mu \acute{\epsilon} \nu o \nu$ , which in an important sense it certainly does, in spite of anything Aristoxenus—only superficially acquainted with their teachings—may say to the contrary.

The suggested identification of the Chroai of Aristoxenus with the Harmoniai or Aulos-scales follows:

Suggested Identification of the Chroai of Aristoxenus and Others with Tetrachords derived from the Aulos-Scales (or Harmoniai) reconstructed by K. S.

Enharmonic Genus.

= in cents 51 + 51 + 408

1. Aristoxenus

```
2. Eratosthenes. Aulos-
                                             \frac{40}{39} \times \frac{39}{38} \times \frac{19}{15} = in cents 44 + 45 + 409
        scale (Hypolydian ac-
                                                                                                                   =498
        cording to K. S.)
 3. Didymus. Aulos-scale
                                                             = in cents 55 + 57 + 386
                                                                                                                   =498
        (Hypodorian K. S.)
         Enh.-Chromatic Genus of Four Quanta to the Fifth (Arist., p. 72 Mb.).
 4. Aulos-scale (Phrygian reconstructed by K. S.) \begin{cases} \frac{24}{23} \times \frac{23}{22} \times \frac{11}{9} \times \frac{9}{8} = \frac{3}{2} = \text{in cents } 74 + 77 + 347 + 204 = 702 \end{cases}
                                                 Chromatic Genus.
 5. Aristoxenus μαλακόν ... \frac{1}{3} + \frac{1}{3} + \frac{1}{6}
6. ἀρμονία (Mixolydian K. S.) \frac{28}{27} \times \frac{27}{26} \times \frac{26}{21}
 5. Aristoxenus μαλακόν
                                                                       = in cents 68 + 68 + 374
                                                                                                                   =510
7. Aristox. \tilde{\eta}\mu i\delta \lambda i \sigma v ... \frac{9}{24} + \frac{9}{24} + \frac{21}{12} = in cents 76.5 + 76.5 + 35.7 8. \tilde{a}\rho\mu ovia (cf. 4) (Phrygian \frac{3}{23} \times \frac{23}{22} \times \frac{11}{9} = in cents 74 + 77 + 24.7 0. Aristov =
                                                                                                                   =498
                                                                                                                   =510
                                                                                                                   =498
                                                                 =in cents 102 + 102 + 306
 9. Aristox. τονιαΐον ...
                                                                                                                   =510
10. Eratosthenes. Aulos-
         scale (Hypolydian according to K. S.)  \frac{20}{19} \times \frac{19}{18} \times \frac{6}{5} 
                                                                 = in cents 89 + 93 + 316
                                                                                                                   =498
11. Aristox. (mixed Chrom., \frac{1}{3} + \frac{2}{3} + 1\frac{1}{2}
                                                                        = in cents 68 + 136 + 306
                                                                                                                    = 510
         p. 52 Mb.)
12. \delta \rho \mu o \nu i a (Lydian K. S.) ... \frac{27}{26} \times \frac{13}{12} \times \frac{6}{5}
                                                                        = in cents 65 + 138 + 316
                                                                                                                   =520
13. Aristoxenus: Enh.-Chrom. unnamed of Four Quanta to the Fifth (p. 72 Mb.),
         identified with an Aulos-scale (Hypodorian) according to K. S. (No. 14).
14. (Pyknon of unequal parts-
                                                                                          ... \frac{16}{15} = in cents 112
           The least as between Hyp. and Parh.
           The next as between Parh. and Lich. ...
           The third smallest, a tone (as between Mesê and Para- \frac{9}{8} = in cents 204
                mesê—K.S.)
                                                                                          \frac{7}{6} = in cents 267
            The largest, as between Mesê and Lichanos
      Sequence from Hypatê Mesôn to Paramesê \frac{16}{16} \times \frac{15}{14} \times \frac{7}{6} \times \frac{9}{8} = \frac{3}{2} (K. S.)
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1 It is recognized that an acceptance of this paper anticipates the publication of a detailed

statement involves a leap in the dark, but this work on the subject.

#### Diatonic Genus.

```
15. Aristoxenus μαλακόν
                                                                               \frac{6}{12} + \frac{9}{12} + \frac{15}{12} = in cents 102 + 153 + 255
 16. ἀρμονία (modified Dorian, as used )
                                                                                \begin{array}{l} \frac{21}{20} \times \frac{10}{9} \times \frac{9}{8} & = \text{in cents } 85 + 182 + 204 \\ & \text{(i.e. 27 cents flat)} \\ \frac{21}{20} \times \frac{10}{9} \times \frac{8}{7} & = \text{in cents } 85 + 182 + 231 \end{array}
              in the Tonoi of the Phrygian
                                                                                                                                                               =471
             and Lydian groups.—K. S.)
 17. Cf. Ptolemy's μαλακόν
 18. Aristoxenus σύντονον

\frac{6}{12} + \frac{12}{12} + \frac{12}{12} = \text{in cents } 102 + 204 + 204 \\
\text{or in cents } 90 + 204 + 204

 19. Didymus σύντονον άρμονία (Hypo-
                                                                                \frac{16}{15} \times \frac{10}{9} \times \frac{9}{8} = \text{in cents } 112 + 182 + 204 = 498
             dorian according to K. S.)
 20. Eratosthenes ἁρμονία (Hypolydian
                                                                                 \frac{20}{19} \times \frac{19}{17} \times \frac{17}{16} = \text{in cents } 89 + 192 \cdot 3 + 216 \cdot 3 = 498
             according to K.S.)
21. Aristoxenus (mixed with Chrom. Parh., pp. 27 and 52 Mb.) \begin{cases} \frac{1}{3} + I \frac{1}{6} + I & = \text{in cents } 68 + 238 + 204 & = 510 \\ 22. \text{ Archytas ap. Ptolemy } \dots & \frac{28}{27} \times \frac{8}{7} \times \frac{9}{8} & = \text{in cents } 63 + 23I + 204 & = 498 \\ 23. & \frac{\alpha \rho \mu o \nu / \alpha}{6} \text{ (Mixolydian according to } \\ & \text{K. S.)} \end{cases} \begin{cases} \frac{28}{27} \times \frac{9}{8} \times \frac{8}{7} & = \text{in cents } 63 + 204 + 23I & = 498 \\ & \text{(cf. No. 27)} \end{cases}
24. Aristoxenus (mixed with Chrom. \begin{cases} \frac{3}{8} + I \frac{1}{8} + I & = \text{in cents } 76 \cdot 5 + 229 \cdot 5 + 204 = 510 \\ & \text{Parh.} \end{cases}
 21. Aristoxenus (mixed with Chrom.
             Parh.)
25. ἀρμονία, artificial formula (Phry-
                                                                              \begin{cases} \frac{24}{23} \times \frac{23}{20} \times \frac{10}{9} = \text{in cents } 74 + 242 + 182 \end{cases}
          gian according to K. S.)
26. Diatonic, Aristoxenus, unnamed of Three Quanta to the Fifth (p. 72 Mb.).
27. Diatonic with lowered Parh. in- \frac{28}{27} = in cents 63
                                                                                    | Identical with άρμονία of Archytas. (Mixolydian according to K. S.)
         Interval of a tone ... ...
         Interval greater than a tone
         Interval of one tone
28. Diatonic, Aristoxenus, unnamed of Four Quanta to the Fifth (p. 72 Mb.). No definition.
29. ἀρμονία according to K. S.
                                                                 \begin{cases} \frac{21}{20} \times \frac{10}{9} \times \frac{9}{8} \times \frac{8}{7} = \text{in cents } 84.4 + 182 + 204 + 231 = 702 \end{cases}
             See No. 16 above
30. άρμονία Dorian, σπονδείον ac-
             cording to K. S. The scale
             of the Elgin Aulos and of \begin{cases} \frac{11}{10} \times \frac{10}{9} \times \frac{9}{8} \times \frac{8}{7} = \text{in cents } 165 + 182 + 204 + 231 = 782 \end{cases}
                                                                                                (i.e. augmented Fifth)
             the Bucheum flute from
             Armant
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It must be confessed on examination of the Table that it would be unreasonable to cavil at Aristoxenus for accepting as equal dieses intervals differing merely by 1 or 2 cents in the Pykna of the Enharmonic genus, and by 2 to 4 cents in those of the Chromatic: i.e. differences equivalent to ratios  $\frac{1731}{1730} = 1.002$  cents;  $\frac{864}{863} = 2$  cents;  $\frac{513}{812} = 3.37$  cents;  $\frac{384}{383} = 4.5$  cents; while the half-comma excess constant in what has been termed the strict interpretation of the Aristoxenian intervals may be expressed by ratio  $\frac{144}{143}$ . A sensitive ear would experience no difficulty in distinguishing the intervals  $\frac{12}{11}$  and  $\frac{11}{10}$  when starting from the same note, but the ear does not readily estimate such differences when the intervals follow one another in melodic succession, ascending or descending in pitch according to the  $\eta\rho\mu\sigma\sigma\mu\acute{\epsilon}\nu\sigma\nu$ . It will at once be apparent that the formulae of Archytas, Eratosthenes and Didymus are claimed as Aulos-scales; nevertheless, there is no attempt in this identification merely to go over the ground already covered by the previous writer: the proposition to be elicited is quite a different one.

It is possible by reliable evidence to establish the facts that these formulae are

<sup>1</sup> Which the scope of this little paper does not allow the writer to produce.

isolated statements by Ptolemy of parts of a homogeneous system based upon the embodiment of a natural law in the Aulos, and not merely cleverly devised divisions of the tetrachord. It seems important at the present juncture to recognize the fact that the Ditonal scale which forms the theme of the treatise of Aristoxenus plays only a very small and unimportant part in the development of music among the Greeks. For instance, it necessarily excludes the immensely significant system of Notation in which lies latent, as a final appeal, a test for the many problems and speculations which still agitate the minds of students of this subject.

A careful scrutiny of the scheme discloses the plan on which the allotment of the symbols has been made, the subtlety of which arouses the profound admiration of the present writer, whereas it provoked derision in Bellermann, who saw in it merely an ill-constructed and clumsy device, which he was at great pains to improve upon. According to the Tables of Alypius it is an indisputable fact that not one single Tonos among the fifteen can be produced as evidence of the use of the Ditonal scale, and only two Tonoi, the Lydian and the Hypolydian, support the accepted theory of a Perfect Immutable System consisting of five tetrachords identical in structure (but of a formula which excludes the Ditonal described by Aristoxenus). It is true that the Ditonal scale is written large over the treatises of the Graeco-Roman theoristsa fact further emphasized by the Arabs, who, after studying and translating these writings, bore the scale and its theory along their victorious path through Persia, India, North Africa, Spain and Sicily. The inference is that the scheme of Notation was the affair of the Harmonists. Ptolemy neither mentions Notation nor makes any use of it: that he was not instructed in their lore is obvious from his Harmonics even on the testimony of Lib. I. c. 16 alone, in which he describes the Homalon Diatonic tetrachord with a condescending indulgence as a kind of rustic yet sweet sounding rara avis, while using, or misusing, the ratios of that Harmonia in his Chromatic σύντονον.

In short the Tables of Alypius provide entirely satisfying evidence that the scheme of Notation was devised for the Harmoniai, and that it had no connection with the Ditonal scale. The Perfect Immutable System must only be considered as a frame, consisting of a series of recognized steps or degrees, the nomenclature of which, indefinite as to the pitch and function of notes, bore only an indication of the relative sequence of positions, as demonstrated by Ptolemy in explaining the use of the ονομασίαι κατὰ θέσιν καὶ κατὰ δύναμιν.¹

The Perfect System was, therefore, equally adapted for the Ditonal and for the Harmonia. Taken at its face value it merely postulates foreknowledge of a certain scale, a precedent followed also in the system of Neums, which can be read with certainty only when the ratios of the mode indicated by the Martyria are known.

Aristoxenus likewise entirely ignores modality, the dominant factor in the formation of the Perfect Immutable System and of the Tonoi; the latter are also left unexplained, as Aristoxenus openly acknowledges (Mb., p. 37; Macr., p. 192), in spite of the fact that 'all that relates to the theory of Scales and Keys was promised as part of his program' (Mb., pp. 1 and 2; Macr., p. 165). The result is that the real connection of the Tonoi with the Modes and species has remained a first-class theme for speculation.

For the most part the formulae of modal scales or Harmoniai quoted in the Table are those of scales widely used in musical circles, taught in the schools of the Harmonists and traditional in Hellenistic Asia among Greeks, Arabs and Persians.

It will be remembered that the formula of the Enharmonic Harmonia of Eratosthenes is reminiscent of the frets of the Tanbur of Bagdad according to Al-Farabi 1, who also describes the borings of pipes with their Arabic notation. It is at once patent that these borings of the finger-holes indicate the ratios of other Aulosscales of the Greeks. The three formulae ascribed to Eratosthenes have a homogeneous structure from a basis common to the three genera; moreover, they are all playable upon an Aulos bored to give that Harmonia. A light is thrown upon his formula for the Diatonic genus by a passage from the Harmonics of Nicomachus of Gerasa (Mb., p. 24), wherein it is stated that the Diatonic tetrachord, according to the Pythagoreans, is based upon the section of the canon, 'not as erroneously expressed by Eratosthenes or Thrasyllus, but as given by Timaeus the Locrian, whom Plato followed. . . .' The implication is that Eratosthenes was using the formula  $\frac{20}{19} \times \frac{19}{17} \times \frac{17}{15} = \text{in cents } 89 + 192 + 216 = 498 \text{ belonging to the Aulos-harmonia,}$ which is practically equivalent to that of the Ditonal scale of the Timaeus, of ratios  $\frac{256}{243} \times \frac{9}{8} \times \frac{9}{8} = \frac{4}{3} = \text{in cents } 90 + 204 + 204 = 498$ ; the substitution in Ptolemy's formula must be laid at the door of Pythagorean enthusiasts. This Harmonia, which I identify as Hypolydian, actually exists as a record on the straight Elgin Aulos (British Museum) when played from Hole 2, and on a flute of Roman provenance recently discovered in Egypt, 2 from Hole 1.

The genesis of the three formulae of Didymus, which has followed an analogous procedure, must likewise be referred to an Aulos-scale, which I identify as Hypodorian. The different respective positions of the ratios  $\frac{10}{9}$  and  $\frac{9}{8}$  in the Syntonon Diatonic of Ptolemy merely signify, according to the present writer's opinion, that Ptolemy has based his procedure in the matter of ratios upon the ascending Harmonic Series.3 The formulae of Archytas as recorded by Ptolemy certainly appear to be indicated by Aristoxenus (as pointed out by Mr. Winnington-Ingram). Diatonic of Archytas (Ptolemy's version) is practically equivalent to the Diatonic with Chromatic Parhypatê (op. cit. Mb., pp. 27 and 52). This tetrachord of Archytas-unnamed but an unmistakable fit-is described by Aristoxenus in the following proposition (Mb., p. 72). 'It is required to prove that the Diatonic genus is composed of two or of three or of four simple magnitudes ' ( $\mu\epsilon\gamma\epsilon\theta\eta = \text{quanta}$ , Macr.). As an example of the Fifth of two magnitudes Aristoxenus mentions the Syntonic Diatonic, a proof that his Ditone has the meaning of two equal tones, the ratio of which would depend upon the value he had in mind for his semitone. Next he states that through the lowering of Parhypate two intervals remain equal and two become unequal, so that 'there will be three quanta constituting the Diatonic genus, namely, an interval less than a semitone, a tone, and an interval greater than a tone' —it is assumed that it is the interval of one tone that is duplicated. continues: 'Again, if all the parts of the Fifth become unequal, there will be four quanta comprised in the genus in question.' Since the magnitude of the diesis and of the third interval is left undefined, the tetrachord of Archytas undoubtedly fits in, while other solutions are not necessarily excluded: thus  $\frac{28}{27} = 63$  cents, the  $\frac{9}{8}$  tone = 204, and the  $\frac{8}{7}$  tone = 231, and again the  $\frac{9}{8}$  as tone of disjunction, total 702. In this order the  $\frac{9}{8}$  tone is placed next the diesis and the Lichanos is at an interval of a

¹ A translation into French of Al-Farabi's treatise (Grand Traité de la Musique) Kitabū L-Mūsīqī Al-Kabīr by Baron Rodolphe d'Erlanger, as the first volume of a projected series to be published under the general title of 'La Musique Arabe.' Paris, Librairie Orientaliste, Paul Geuthner, 1930. See section on Flutes, with diagrams, pp. 263 sqq. Those who are versed in the acoustic properties of reed-blown pipes and flutes will be able to distinguish erroneous from true statements in this section. For the Tanbur of Bagdad see pp. 218 sqq. Al-Farabi, born

A.D. 872, died A.D. 950.

<sup>2</sup> The flute was found in a Roman dump during the excavation of the Bucheum by Dr. Robert Mond at Armant, with Mr. Oliver Myers as Director of the Expedition sent out by the Egypt Exploration Society.

<sup>3</sup> Ptolemy thus uses the ratios of the Harmonic Series while demonstrating the practice by means of lengths of string, a contradiction which would account for certain difficulties in interpretation encountered throughout his treatise.

septimal tone from Mesê, an arrangement which is in accordance with the Aulosscale (Mixolydian according to K. S.), from which the formula of Archytas undoubtedly derives; it likewise accords with Ptolemy's division of the Fourth into two ratios,  $\frac{7}{6} \times \frac{8}{7}$ , whereas the tones, reversed in position as in his formula, divide the Fourth into the ratios  $\frac{32}{27} \times \frac{9}{8}$ , a Ditonal combination which is out of place with a Parhypate lowered to  $\frac{28}{27}$ . The objection to the lowering of the Diatonic Lichanos below the tone postulated between it and Mesê may be met by drawing attention to Bellermann's interpretation of Notation, according to which the interval of a  $\frac{9}{8}$  tone between Lichanos and Mesê, and in analogous positions in the other four tetrachords, only occurs, unnoticed by him, in forty-six out of the seventy-five Diatonic tetrachords belonging to the fifteen Tonoi.

If we now turn to the Fifth of four magnitudes it is found that there is no indication of values of any kind given; the gates are left wide open to speculation. One fact, however, emerges, i.e. that tones of three different ratios must be found which with the addition of Parhypate will comprise a Fifth. It will be difficult to escape the admission here of the  $\frac{10}{9}$  tone, unless it be assumed that Aristoxenus had in mind the  $\frac{19}{17}$  tone of 192 cents occurring in the Aulos Diatonic of Eratosthenes [q.v.] as an alternative to the tone of 204 cents, a difference of half a comma. What then is this Fifth of four quanta? If the formula of the Diatonic μαλακόν of Aristoxenus be suggested, viz.  $\frac{1}{2} + \frac{3}{4} + 1 + 1 = \text{in cents } 102 + 153 + 255 + 204 = 714$ , which actually has four quanta, why was he silent concerning this example? Was he conscious of the excess of half a comma over the Fifth? This would be inconsistent with his acceptance of the same excess for the tetrachord interpreted literally. Aristoxenus may have had in mind a scale almost identical with Ptolemy's soft Diatonic, of ratios  $\frac{21}{20} \times \frac{10}{9} \times \frac{9}{8} \times \frac{9}{7} = \frac{3}{2} = \text{in cents } 85 + 182 + 204 + 231 = 702$ , which it fits exactly. This is an Aulos-scale (see Table Nos. 16 and 29), restated by Ptolemy, possibly out of regard for the sanctity of the perfect Fourth, but which entails a violation of the principle underlying the boring of finger-holes on the Aulos. The statement by Aristoxenus of the Fourth and Fifth by quanta suggests the lower or conjunct part of the Perfect System, viz. from Hypatê Hypatên to Paramesê. There are other Aulos-scales of four quanta which might legitimately be cited here, such as the δμαλδν διάτονον recorded by Ptolemy and regarded by the previous writer as 'a curious scale' and 'a peculiar looking tetrachord' (pp. 201 and 204); that it was certainly not an invention of Ptolemy's is clear from his description and from the epithets ξενικώτερον μέν πως καὶ ἀγροικότερον he bestows upon it (Lib. I. C. 16). This tetrachord of ratios  $\frac{12}{11} \times \frac{11}{10} \times \frac{10}{9}$ , duplicated, has continued in use in Asia Minor to the present day in some few of the Greek churches1 and among the Eastern Arabs.<sup>2</sup>

It may be of interest to note at this point that the  $\sigma\pi\nu\nu\delta\epsilon\hat{\iota}\nu$ , according to Plutarch, was a Libation Hymn played on the Aulos, and that it was duly characterized by the interval of three dieses known as  $\sigma\nu\nu\tau\nu\nu\delta\tau\epsilon\rho$   $\sigma\pi\nu\nu\delta\epsilon\iota\alpha\sigma\mu\delta$ . Aristides Quintilianus adds that the  $\sigma\pi\nu\nu\delta\epsilon\iota\alpha\sigma\mu\delta$ ,  $\tilde{\epsilon}\kappa\lambda\nu\sigma\iota$  and  $\tilde{\epsilon}\kappa\beta\nu\delta$  were intervals used by the Ancients in the differentiations of their  $\delta\rho\mu\nu\nu\iota$  the Spondeiasmos as a rise of three dieses, the Eklysis as a fall of three dieses. The whole question bristles with controversial points which cannot be discussed here, but the epithet  $\sigma\nu\nu\tau\nu\delta\nu\delta\tau\epsilon\rho\nu$  applied to the  $\sigma\pi\nu\nu\delta\epsilon\iota\alpha\sigma\mu\delta$ s gives the clue to the strange fact that two unusual intervals of the same magnitude were known by different names, according to their use in

<sup>&</sup>lt;sup>1</sup> Über die altgriech. Musik in der griech. Kirche, by Dr. Joh. Tzetzes, München, 1874. See pp. 30, 52, 77, 83, 93, etc.

<sup>&</sup>lt;sup>2</sup> Ascertained from an Arabian Professor of Music in Cairo by means of monochord tests by M. F. Grant.

<sup>&</sup>lt;sup>3</sup> De Musica, ed. Weil and Reinach, C. 11, p. 1135, pp. 42-51, §§ 108, 114-117; and C. 19, pp. 72-77, §§ 168-177. Cf. Aristoxenus, Mb., p. 37, and Macr., p. 193.

<sup>4</sup> De Musica, Lib. I., p. 28 Mb.

ascending or descending passages respectively; the necessity for such a distinction is difficult to realize. The explanation is supplied by the fact that the epithet συντονώτερος is applied to the first step in the scale and draws attention to the effort required by the Aulete to produce, instead of the diesis or semitone, the larger interval of three dieses (the present writer has reason to interpret this as of ratio  $\frac{11}{10}$  = 165 cents), which necessitates a tightening of the muscles controlling the glottis, in order to effect the greater compression of the breath needful to produce the higher Parhypatê. On the other hand, the ekkluous, indicating feebleness, relaxation, bears an analogous reference to the slackening of the muscles of the glottis that takes place when the Aulete is descending to a lower note. The fact that the σπονδειασμός is said by Plutarch to occur in the Dorian Tonos and that the ἔκλυσις is attributed to Polymnestos, together with the Hypolydian Tonos, in which Tonoi (read as Aulosscales) the intervals in question are actually found in the positions specified, corroborates the statement of Aristides that these intervals were used by the Ancients in the Harmoniai. The Spondeion is the scale for which the Elgin Aulos at the British Museum was bored, starting from finger-hole 1; and it is also the scale given by the Roman flute mentioned above when played from the exit; the Spondeiasmos syntonoteros is thus obtained on both pipes and the Eklysis from the harmonic register of the flute in the descending Hypolydian Harmonia.

Thus Aristoxenus reveals the fact—hitherto overlooked—that two rival systems, both using the σύστημα τελείον ἀμετάβολον for the exposition of their theories, were contending for the mastery in musical matters. The Harmonists, by far the better equipped by reason of their practical application of ratio for the exact determination of intervals, by their use of certain Katapyknotic diagrams, expressed in the παρασημαντική notation to which they justly assigned great importance, were sure of their ground. The probability is, moreover, that the monochord—the custodian of the ratios of the Harmoniai—was used in the schools, as enjoined by Pythagoras. This was the modal system of the Ancients, parts of which have survived in folk music at the present day.

The Aristoxenian non-modal system founded on the pan-pipe scale derived from a cycle of seven ascending Fourths (not Fifths, as commonly asserted) was later known through the theorists as ditonal. Musical opinion, misled by the sanction bestowed by the Timaeus of Plato upon the scale resulting from a geometrical progression by three (= cycle of perfect Fifths), failed to notice the difference in practice between the two.

The cycle of Fourths<sup>5</sup> produces a conjunct scale having a limma as first step and a perfect Fourth on the Tonic; the cycle of Fifths has a tone as first step and an augmented Fourth on the Tonic—i.e. a Tritone.

In terms of melodic material for the making of music, the struggle was between the tetrachordal agreggates—as voiced by Aristoxenus and later by Ptolemy—and the octave unit of the Harmonists with their seven octave scales which they called Harmoniai. These Harmoniai were not at this time independent scales produced by the haphazard boring of finger-holes along the length of the pipe. The seven Harmoniai were kindred modal scales, produced by the operation of one law which is embodied in every pipe or flute, and which in application results in a definite series of intervals, bearing ratios conditioned by the position of the finger-holes. To the primitive pipe-maker the process is simplicity itself, but to the theorist, who is invariably constrained to begin at the wrong end, it was, and still remains, a sore puzzle; it has in consequence been left severely alone.

LONDON.

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<sup>1</sup> De Musica, pp. 112-113, C. 29, § 287.

<sup>&</sup>lt;sup>2</sup> Macr., pp. 188-189 (Mb., p. 32).

<sup>&</sup>lt;sup>3</sup> Ibid., p. 194 sq. (Mb., pp. 39-41).

<sup>4</sup> Arist. Quint., Lib. III., p. 116 Mb.

<sup>&</sup>lt;sup>5</sup> Cf. Aristoxenus, Macr., p. 206 (Mb., p. 55), in which the process is given for the Ditone, and by implication for the scale.

<sup>6</sup> Macr., p. 192 (Mb., p. 36)



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# TOWARDS A HISTORY OF TONOI

## JON SOLOMON

The tonos element of ancient Greek music and ancient Greek music theory and the scholarship treating tonos in the modern era—"modern" meaning the era beginning with Boethius—have offered us a variety of difficulties and contradictory solutions. At the outset, let me assure you that I have no intentions of doing or contributing anything to this tonic can of worms other than discussing and relating several of these difficulties, thereby adding a worm or two. I will focus briefly on one particular aspect of the problem—the discussions of tonos and species in Cleonides' Eisagoge harmonike. In doing so, I intend to touch briefly on the tonos theories of Aristoxenus and his predecessors, Eratocles and the Harmonists, as well as on the shifting thetic system of Ptolemy. Hopefully I can assist any ensuing discussion of these matters by highlighting the diversity of our evidence and proposing a chronological framework for its development. I expect that the learned members of this panel can individually or collectively do more with this material than I have. At best I have tried to make some chronological sense out of a chronically chaotic situation.

At the outset let me attempt to clarify why we do not have and could never have a completely unified, consistent, coherent accounting of ancient Greek music and music theory. Ancient Greek music included the Ionian (that is, Asian) epic chants of Homer and the rhapsodes, the Aeolic (Greek islander) songs of Sappho and Alcaeus, the Dorian (Southern Greek) lyrics of Pindar (the epinician poet), Aeschylus, Sophocles, Euripides (the tragic poets), and Aristophanes (the comic poet), the Hellenistic Delphic (Northern Greek) paeans to Apollo, the funerary, pagan, Seikilos inscription from the first century, a "Christian hymn" from the fourth, and the rest of an entire corpus, almost all of it lost, of Greek music composed without, and then with, the aid of notation and technical schooling throughout the period of some 1200 years from Homer to Boethius. Finding a consistent strain of any significant sort in such a collection of regional dialects, ethnic tra-

<sup>&</sup>lt;sup>1</sup>All of the music of Homer, Sappho, Alcaeus, Pindar, Aeschylus, and Sophocles is, so far as we know, lost. I do not admit the reconstruction of Homer's music as proposed by M. L. West, "The Singing of Homer and the Modes of Early Greek Music," *The Journal of Hellenic Studies* 101 (1981) 113-29, nor does the modern consensus consider Athanasius Kircher's music to Pindar *Pythian* 1 genuine. It could be that a musically notated tragic fragment such as *P.Berol.* 6870, lines 16-23, could be Aeschylean, but this has not yet been proven. The paeans, Seikilos inscription, and "Christian Hymn" (*P.Oxy.* 1786) as well as the Euripidean *Orestes* fragment are to be found in Egert Pöhlmann, *Denkmäler altgriechischer Musik* (Nürnberg 1970) #20, 18, 19, 21, and 34, respectively. For the Euripidean *Iphigeneia* fragment, see most recently Thomas J. Mathiesen, "New Fragments of Ancient Greek Music," *Acta musicologica* LIII (1981), 14-32.

ditions, polytheistic and monotheistic religions, and various artistic purposes and technical trainings would be even harder than finding a consistent strain of any significant technical/theoretical sort in the last 1200 years of "modern" Western music, the prospects of which, one must agree, are not encouraging. The same will need to be said for the theoretical studies which have survived from antiquity. We cannot realistically expect theoreticians trained in two diametrically opposed philosophical schools—the Pythagorean and Aristoxenian—who could not agree whether the study of music was a mathematical science or an aural experience, and who wrote over the course of seven centuries—to concur on every major theorem, methodology, or even terminology, no matter how conservative their trainings were. "Ancient Greek music" encompasses over 1200 years or more of different musical theories. "

Complicating the matter further is what has been traditionally understood to be a lack of interchange between those who made ancient music and those who wrote about it. In the past, late-nineteenth- and twentiethcentury scholarship found little connection between the fragments of ancient Greek music and the extant treatises of the music theorists, but contemporary scholarship is in the process of remedying this blanket misconception. 4 I have elsewhere bored people to the point of tears by inspecting ad nauseam the elements of one of the surviving pieces of Greek music, the Seikilos inscription, through an Aristoxenian music theoretical analysis:<sup>5</sup> and Professor Mathiesen elsewhere and here shows that ancient theories of ethos and musical rhythm and meter as found in Aristides Quintilianus apply very neatly to several extant pieces of Greek music, including the new Euripides IA fragment.<sup>6</sup> Even so, the correspondence between ancient Greek music and ancient Greek theory seems to be far from total, and this must be attributed for the most part to the first two factors described above. namely, that we are dealing with theoreticians and musicians who geo-

<sup>&</sup>lt;sup>2</sup>Modern scholarship recognizes these difficulties in the metrical, linguistic, contextual, and organological aspects of the poetry and iconography. See, for instance, W. Sidney Allen, *Vox Graeca*<sup>2</sup> (Cambridge, 1974) and M. L. West, *Greek Metre* (Oxford, 1982) *passim*. There is as yet no current work on the organological differences between musical genres, but a large volume on chordophones and their usages by Professor Jane Snyder of the Ohio State University is in the final stages of preparation.

<sup>&</sup>lt;sup>3</sup>The 1200 years encompass the period from Homer (c. 700 B.C.) to Boethius (d. 524 A.D.), but it is known that Homer had Mycenaean and Minoan musical predecessors antedating him by as much as a millenium. The ancient theorists begin with Aristoxenus (c. 300 B.C.), but one could easily include Damon of the fifth century B.C.

The terminology varies between authors; *tonos*, *harmonia*, *tropos*, and *modus* are terms used often indistinguishably to describe the same phenomenon. It can vary even within one treatise; Cleonides, for instance, uses *skēma* and *eidos* ("figure," "species") interchangeably.

<sup>&</sup>lt;sup>4</sup>The traditional consensus is still found in Annemarie Neubecker, *Altgriechische Musik; eine Einführung* (Darmstadt, 1977) 93, "Ob die musikalische Praxis gegen Ende dieser langen Zeitspanne der dargestellten Theorie noch entsprach, ist mehr als zweifelhaft."

<sup>&</sup>lt;sup>5</sup>This was a paper, "The Seikilos Inscription: An Aristoxenian Analysis," delivered for a panel on ancient Greek music and music theory at the annual meeting of the American Philological Association in San Francisco in 1981. A written version of that paper, "The Seikilos Inscription: A Theoretical Analysis," has been submitted for publication.

<sup>&</sup>lt;sup>6</sup>See Thomas J. Mathiesen, "New Fragments" (supra, n. 1), his Aristides Quintilianus On Music (New Haven and London, 1983), 94-113, and his paper in the present volume, pp. 264-86.

graphically span the entire Mediterranean basin from Ptolemy's Alexandria to Aristoxenus' Italy to Nicomachus' Gerasa and who temporally span a period from the time of Homer's predecessors to the time of Boethius—more than one millenium.

It would therefore seem to be almost dangerous to propose any unifying theory separate from a carefully analyzed chronological development through this millenium. Unfortunately, the space allotted here forbids such a carefully analyzed chronological development; a full chronological history of *tonos* alone would burst the seams of one volume. So what I present here is rather sketchy and newborn. I will try out these ideas here in the hope that they may be nurtured or mercifully put out of their misery before they grow into a scholarly nuisance.

Covered by all these disclaimers and caveats, I can now move on to Cleonides' seemingly isolated discussions of *tonos* and species. I say "seemingly isolated" since these discussions in particular, representative of Aristoxenian theory, seem not to concern themselves with musical practice but with only neatly packaged and progressively built theoretical definitions. This is only partly true, as I hope to demonstrate.<sup>7</sup>

Cleonides (202.6ff) tells us that the word "tonos" refers to a variety of things. Most important for our purposes is his third definition of the term. Actually, it is not a definition at all; he says merely, and I translate literally,

'ο δὲ ὡς τόπος φωνῆς, ὅταν λέγωμεν δώριον ή φρύγιον ἡ λύδιον ἡ τῶν ἄλλων τινά. εἰοὶ δὲ κατὰ Αριστόξενον ιγ τόνοι.

[Tonos is described] as the locus of the voice whenever we speak of the Dorian, Phrygian, Lydian, or one of the other [tonoi]. There are, according to Aristoxenus, thirteen.

Cleonides then lists the *tonoi*. He lists thirteen which is, incidentally, not the number given by Aristoxenus who does not actually list them at all in the extant works. Cleonides lists the *tonoi* in descending order and by geographical appellation from the Hypermixolydian (Hyperphrygian) to the Hypodorian. In a brief, concluding paragraph battered in the manuscript tradition, he tells us that each *tonos* stands one halftone apart from its

<sup>&</sup>lt;sup>7</sup>Cleonides is absolutely unknown to us except for Aristoxenus as a *terminus post quem*. The second-century A.D. date found in the handbooks and encyclopedias has no basis. The text of Cleonides has been reedited and will appear in a forthcoming volume of the *Musici scriptores graeci* I am preparing for B. G. Teubner Verlag (Leipzig). For a translation, see Jon Solomon, *Cleonides Eisagoge harmonike; a critical edition, translation, and commentary* (Ph.d. diss., Chapel Hill, 1980) 145-61, or Oliver Strunk, "Harmonic Introduction," in *Source Readings in Music History* (New York, 1950), 34-46. The textual references used in this paper are to Carl von Jan, *Musici scriptores graeci* (Leipzig, 1895).

<sup>&</sup>lt;sup>8</sup>Cleonides (202.6 - 202.8) defines *tonos* as 1) a note, 2) an interval (= one wholetone), 3) a region of the voice, and 4) a tuning. The third definition is the one in question.

<sup>&</sup>lt;sup>9</sup>Cleonides (203.7 - 204.8): "Hypermixolydian, also called Hyperphrygian; two Mixolydians, a higher and a lower, of which the higher is also called 'Hyperionian,' and the lower 'Hyperdorian'; two Lydians, a higher and a lower, of which the lower is also called 'Aeolian'; two Phrygians, a higher and a lower, of which the lower is also called 'Ionian'; one Dorian; two Hypolydians, a higher and a lower, of which the lower is also called 'Hypoaeolian'; two Hypophrygians, of which the lower is also called 'Hypoionian'; Hypodorian.''

neighboring *tonoi*. <sup>10</sup> Never does he tell us the intervals or the internal structure used in each *tonos*. Never does he tell us how they derived their geographical appellations; never does he tell us how they compare with the octave species (let alone with the *harmoniai*, which he never even mentions).

When he discusses the octave species (197.4ff), on the other hand, he does describe the intervallic structure within each species, which suggests that he recognized some difference between the octave species and the tonoi. However, at the end of each description he associates the octave species with some of the same geographical appellations he had used for the tonoi (this time, of course, in ascending order). To describe the intervallic structure he uses the position of the disjunctive wholetone; each enharmonic and chromatic dia pason, according to the Aristoxenian Cleonides, includes only the one disjunctive wholetone and two pairs each of ditone plus two quartertone dieses or trihemitone plus two halftones. Cleonides traces the extraneous, disjunctive wholetone as it progresses in a descending direction while its surrounding intervals correspondingly progress upwards. Cleonides describes this opposite ascending movement by the names of the notes, not by the location of the intervals. So while the bottommost notes ascend from hypate hypaton to mese and the uppermost from paramese to nete hyperbolaion, the wholetone interval descends from the uppermost locus to the bottommost. Interestingly, Cleonides describes the descending locus of the wholetone as moving from highest, to second highest, third highest, fourth highest, fifth highest, sixth highest, and lowest. The movement is described throughout in relation to the highest locus.

This contrasts slightly with his analysis of the diatonic *dia pason* species, for there he describes the position of the two halftones. Again he describes the intervals as descending and the notes as ascending, but the positionings of the halftone intervals he describes in a more complex manner: In the first species of the the diatonic *dia pason*, the halftones are first from the bottom and fourth from the top; in the second species, third from the bottom and first from the top; in the third, second from the bottom and top; in the fourth, first from the bottom and third from the top; in the sixth, third from the bottom and second from the top; and in the seventh, second from the bottom and third from the top.<sup>11</sup>

It is only at the very end that Cleonides adds that these diatonic species "are called by the same names" as the species of the enharmonic and chromatic. This suggests that the enharmonic and chromatic genera were of primary importance to him. At least he approaches the species of the *dia tessaron* and *dia pente* in the same order, enharmonic and chromatic first, diatonic last, and this in turn suggests that the concept of the octave species goes back chronologically at the latest to the pre-Aristoxenian theorists,

<sup>&</sup>lt;sup>10</sup>The text here as reported in Jan (*supra*, n. 7) 204.9 - 204.12, is corrupt in describing the intervals between each *tonos*, but it seems clear that no additional information about the structure of a *tonos* has been lost.

<sup>&</sup>lt;sup>11</sup>See the diagrams in Jan (supra, n. 7) 195 (dia tessaron), 196 (dia pente), and 197 (dia pason).

most likely to Eratocles, in the fifth or fourth century B.C. Such a dating accords with our meager knowledge of the so-called Platonic (fourth-century) scales reported by Aristides Quintilianus, which are not basically diatonic in nature but enharmonic. <sup>12</sup> It may be, then, that the octave species as an entity of music theory dates back to the pre-Aristoxenian period, the late-fifth or early-fourth century B.C.

Textual evidence for this can be found where Aristoxenus criticizes the Harmonists for omitting any analysis of the octave species. They did omit it, but Eratocles alone, Aristoxenus tells us, did "attempt without proof to enumerate the figures [i.e. species] of the *dia pason* in one genus; he demonstrated it *via* the  $\pi \in \text{pi} \oplus \text{po} \hat{\alpha}$  of the intervals." This  $\pi \in \text{pi} \oplus \text{po} \hat{\alpha}$  ("carrying around") of the intervals no doubt refers to the seemingly revolving ascending and descending scales one sees in diagramming the movement of the species  $^{14}$ —where the halftone or wholetone moves in the octave species in order from highest to lowest, in the *dia tessaron* and *dia pente* species from first to third and around again cyclically. The actual analysis of the *dia pason* species is not found in the extant works of Aristoxenus, but it seems clear from this passage that the concept of the *dia pason* species predates Aristoxenus and was perhaps invented by Eratocles (in the enharmonic species alone).

Aristoxenus in the same passage is critical of Eratocles and the Harmonists for not analyzing the species of the dia tessaron and dia pente, but in the extant works of Aristoxenus there is no such analysis to be found. Cleonides, for whose date we have only the aforementioned terminus post quem of Aristoxenus (and the Byzantine Bryennius as a terminus ante quem), is perhaps our earliest source for an analysis of the species of the dia tessaron and dia pente, and he again begins with an analysis of the enharmonic and chromatic. He, or perhaps his source Aristoxenus, described the enharmonic and chromatic dia tessaron and dia pente species first because Eratocles had described the enharmonic dia pason species first. In fact, Cleonides describes the three figures of the enharmonic and chromatic dia tessaron not by the names of the notes or the numerical relationships of the intervals but as being bounded by the barypykna, mesopykna, and oxypykna, respectively. Without precisely defining the word "pyknon," I will remind the reader here that the pyknon is found only in the enharmonic and chromatic genera (which is why these might be labeled the "pyknic genera''). 15 Since the diatonic genus has no pyknon, he analyzes the diatonic dia tessaron last, and he does so according to the placement of the lone halftone. Similarly, he analyzes the enharmonic and chromatic species of the dia pente by the placement of both the barypykna, mesopykna, and

 $<sup>^{12}</sup>$ Aristides Quintilianus *De musica* 19.2 - 19.10 (Winnington-Ingram) and Mathiesen (*supra*, n. 6) 20 and 86.

<sup>&</sup>lt;sup>13</sup>Aristoxenus #2 (166[Macran]; 6.14 - 7.8 and 11.2 - 11.12 [da Rios]).

<sup>&</sup>lt;sup>14</sup>See the diagrams cited *supra*, n. 11.

<sup>&</sup>lt;sup>15</sup>The pyknon is, according to Aristides Quintilianus 9.15 - 9.16 (Winnington-Ingram), an arrangement of three notes, but the term is used only with the lower three notes of a distinct enharmonic or chromatic tetrachord.

oxypykna and the disjunctive wholetone, and he analyzes them before the species of the diatonic *dia pente*. In all likelihood, Cleonides, following Aristoxenus, bases his analyses of the *dia tessaron* and *dia pente* species on the traditional, pre-Aristoxenian species of the *dia pason*.

What, then, might be the relationship between Cleonides' octave species and his tonoi, the former elaborately analyzed and geographically labeled, the latter simply listed and geographically labeled without elaboration? It seems to me that the octave species (and with them of course the dia tessaron and dia pente species) are analytical, the tonoi practical in conception. The very concept of the "species" (eidos, skema) is not developed until late in the fifth century or early in the fourth century in Academic (Platonic) terminology. In the late-fifth century, for example, for the comic playwright Aristophanes the word skēma is a "figure" of a dance; for the historian Thucydides it is a "figure" or "characteristic" of a city-state. For the late-fifth-century Hippocratic medical corpus, skema is a "position" of the body. Within one generation, however, in the early-fourth century, Plato is using both eidos and skēma to refer to figures, types, Forms; with Aristotle in the next generation the words are canonized as peripatetic categories. 16 Eratocles probably used the words in the same sense as Aristophanes, Thucydides, and [Hippocrates], that is, in a proto-technical application of a common word, whence the peripatetic Aristoxenus easily adopted it into his analyses of the "figures," i.e. species, of the dia tessaron, dia pente, and dia pason. For Aristoxenus, the terms are purely analytical and not at all native to actual music.

Informing us of this relatively recent and continuing development in music theory and terminology, Aristoxenus (#6 = 11.2-11.12 [da Rios]) tells us that Eratocles alone investigated the figures (species) of the octave, that "none of his [Aristoxenus'] predecessors" did so [169 Macran]; 10.18-10.19 [da Rios]:  $\tau \tilde{\omega} \nu \delta$ " άλλων καθόλου μὲν καθάπερ ξμπροσθεν ε ἴπομεν οὐδεὶς ἡπται), and that he, Aristoxenus, was first to analyze the species of the *dia tessaron* and *dia pente*, which he emphasizes should be done first. Aristoxenus' *dia tessaron* and *dia pente* divisions have not survived. Cleonides', of course, have, and following Aristoxenus' guidelines he begins with the species of the *dia tessaron* and proceeds to the *dia pente* and then the *dia pason*.

It is no accident that Cleonides, following the tradition, in this instance Aristoxenus, analyzes the species of the enharmonic and chromatic first, the diatonic last. This preserves the order of things passed down from Eratocles, with his lost analysis of the enharmonic octave species, to Aristoxenus, with his lost analyses of the enharmonic, chromatic, and diatonic dia tessaron and dia pente species, to Cleonides, about whom everything but his name and treatise is lost. (One sees here from the gaps in our evidence another reason that a complete and coherent analysis of ancient Greek music tonal theory is so elusive.)

<sup>&</sup>lt;sup>16</sup>These and other examples can be found in L.S.J., q.v.  $\sigma x \hat{\eta} \mu \alpha$ .

Surely something is different and irregular about Cleonides' direct or indirect source here, for elsewhere Cleonides normally begins with the diatonic and then proceeds to the chromatic and then last to the enharmonic. He introduces the three genera in this order (181.12). He analyzes the three genera in this order (181.13). He lists the names of the notes (182.4 - 184.10) in the same order, and he reintroduces the three genera (189.10) in the same order—diatonic, chromatic, enharmonic.

The species he treats differently, as we have seen—enharmonic, chromatic, diatonic. So far as we can tell, the octave species is an analytical device developed by Eratocles who, according to Aristoxenus, with or without the Harmonists divided the entire *dia pason* system of notes into twenty-eight quartertone dieses. <sup>18</sup> It looks as if the octave species is an analytical contrivance devised by Eratocles to assist him in maneuvering his music up and down his impossibly close-packed quartertone system and that the species of the *dia tessaron* and *dia pente* are then additional species devised and developed by Aristoxenus to conform to his notion that all Greek music consists of regularized conjunct and disjunct tetrachords. <sup>19</sup>

The *tonoi*, on the other hand, represent real music for these earlier theorists. When Aristoxenus discusses them, he compares (#37) the confusion about the number, make-up, and relationship of the *tonoi* with the confusion about the ancient Greek calendar. The tenth day of the month at Corinth falls on the same day as the fifth day of a different month at Athens and this same day is the eighth day of some other month somewhere else. Indeed, this example offered by Aristoxenus illustrates further some of the problems I outlined at the beginning of this paper, and it should be considered not at all unique to ancient Greek music. Be it in the distribution of the 365½ days of the year, the *tonoi* of ancient Greek music, ancient Greek political systems, ancient Greek philosophical schools, or ancient Greek genres of poetry, ancient Greece is almost never a unified entity but a collection of city-states each steeped in its own habits, culture, traditions, and music.

In the archaic period—the seventh and sixth centuries B.C.—these differences surely provided the climate for the creation of the different harmoniai—the Dorian from the austere tribe of southern Greece, the Lyd-

<sup>&</sup>lt;sup>17</sup>He does so (181.13 - 181.16) in the same, colorless, detailed, peripatetic fashion as the rest: "The diatonic consists of a wholetone plus wholetone plus halftone descending, ascending, the opposite, halftone plus wholetone plus wholetone. The chromatic consists of a trihemitone plus halftone plus halftone descending," etc.

<sup>&</sup>lt;sup>18</sup>This could well be an *argumentum ex silentio*, but Aristoxenus for one says that ''none of the others'' describe or analyze the octave species. Aristoxenus could be misrepresenting the truth, of course. Ancient authors often misrepresent another's theories, particularly in that age in which legal recourse for such misrepresentation was unavailable.

<sup>&</sup>lt;sup>19</sup>Aristoxenus, Book III (passim), discusses this. See 209 - 222 (Macran) or 73 - 92 (da Rios).

<sup>&</sup>lt;sup>20</sup>Aristoxenus #37 (46.20 - 47.1 [da Rios]):

ἀλλὰ παντελῶς ἔοικε τῆ τῶν ἡμερῶν ἀγωγῆ τῶν ὰρμονικῶν ἡ περὶ τῶν τόνων άπόδοσις, οἶον ὅταν κορίυθιοι μὲν δεκάτηυ ἄγωσιν Αθηναῖοι δὲ πέμπτον ἔτεροι δέ τινες ὀγδόην.

<sup>&</sup>quot;But the situation with the *tonoi* is very much like the arrangement of days, whereby the tenth day for the Corinthians is the fifth for the Athenians and the eighth for others."

ian from the affluent, haughty, oriental society of the Asian coast, and the Phrygian from the unbounded, ecstatic peoples of the wild, mountainous regions of the Anatolian highlands. By "different" I do not mean just different *tonoi*, i.e. "scales," but entirely different ethnomusical systems—scales, instruments, subject matter, dance, poetry, and ethos.

Of course we have no external examples of analytical music theory from the seventh, sixth, or fifth centuries B.C., and it is only in the fourth century that Plato and Aristotle give us their brief, descriptive, that is, ethical, musical philosophies. <sup>21</sup> By this time the national *harmoniai* seem to have become rather standardized. This probably begins to happen as early as the time of Damon, and it continued surely in fifth-century Athenian tragedy. It is not entirely a "national" matter when Plato and Aristotle admit and reject certain "harmoniai" in establishing their ideal states. They reject not Lydian music but Lydian-style music. Roughly contemporary with Plato and Aristotle, however, are Eratocles' regularizing theories and those of the Harmonists. They continue to break down the old harmoniai which are now rapidly becoming tonoi with more regularized constituent parts and more compatible interrelationships. Finally with Aristoxenus one or two generations later we get our first complete, unified, and all-encompassing analytical theory.

We have two musical examples from fifth-century Greek lyric music, and the music of the *Orestes* papyrus at least can be shown to belong to the Phrygian (or Dorian) harmonia (as described in Aristides Quintilianus).<sup>22</sup> This Euripidean tragedy of the very late fifth century, the *Orestes*, predates Aristoxenus by nearly a century, so I would not be surprised to find it not competely analyzable by Aristoxenian analysis. After all, Euripides wrote his music within the systems of the nearly standardized harmoniai of the fifth century; Aristoxenus analyzed in a peripatetic fashion the music theory of the fourth. Aristoxenus' tonoi do not necessarily therefore belong to the practical music of a century before his day (in a city not native to him; he was not an Athenian). The tonoi he discusses are instead the variegated and separate but slightly modified musical systems of his own era. He recognized the irregular national systems. He was disturbed by the previous attempts by Eratocles and the Harmonists at regularizing them, so his solution was to contrive the Greater Perfect System to admit all the notes in the various tonoi. This Greater Perfect System was somewhat like Eratocles' shifting enharmonic system, but it accommodated the diatonic and chromatic as well as the enharmonic genera. Aristoxenus no doubt had to squeeze some of the intervallic leaps used originally in the native, tribal harmoniai and then in the tonoi into or out of the great system, but such is the universally compromising force of standardization. The difference between our own tempered and non-tempered systems provides somewhat of a parallel.

<sup>&</sup>lt;sup>21</sup>Plato Rep. 398 C - 399 E; Arist. Pol. 1340<sup>a</sup>38 - 1340<sup>b</sup>10.

 $<sup>^{22}</sup>Supra$ , n. 12. The intervals would be (in the enharmonic):  $1 + \frac{1}{4} + \frac{1}{4} + 2 + 1 + \frac{1}{4} + \frac{1}{4$ 

The end result of Aristoxenus' efforts at standardization was apparently the list of *tonoi* found now in Cleonides. Aristoxenus never lists the *tonoi* in the extant works. He does in section 37 mention several of them, but this is to illustrate the confusion.<sup>23</sup> It must have been elsewhere that he or Cleonides or an intermediate theorist standardized these *tonoi* completely to fit into the Greater Perfect System with each of the thirteen *tonoi* standing one halftone above the preceding, e.g. beginning on A, A#, B, c, c#, d, d#, e, f, f#, g, g#, and a again in the next octave.

Someone finding hypocrisy in my stating that the species of the dia tessaron, dia pente, and dia pason were merely analytical contrivances could easily jump in here to claim that "you yourself in your tedious analysis of the Seikilos inscription try to prove that the piece is built upon the modulation of various species of the dia tessaron and dia pente." Indeed I did try to prove that the species of the dia tesseron and dia pente were integral parts of the composition of the Seikilos inscription, and I still believe that to be the case. But I now clarify this: Some of the music, including the Seikilos inscription, written well after the promulgation of Aristoxenus' theories—and his work was well-known all over the Greco-Roman world<sup>24</sup>—was written in compliance with Aristoxenian guidelines. That so many of our fragments of ancient Greek music are analyzable (with the Alypian tables) as belonging to a certain pitch-standardized tonos (tropos) while at the same time being analyzable through a thetic shift as belonging to a certain octave species, I attribute in part to this fact. Aristoxenus not only fit the music, the variegated tonoi (once harmoniai) as well as the Eratoclean octave species into one musical system of standardized notes and intervals, but he also created the standardized system upon which almost all subsequent music in ancient Greece and Rome is based. Parallels for one man's theoretical analyses of music and theoretical constructs setting the standard for the composed music of subsequent generations are apparent from the past few centuries, so it is highly possible that Aristoxenus, who we know was regarded as a giant in the field in antiquity, had as much an effect on ancient music theory and practice as did his contemporary Theophrastus on ancient botany or his teacher Aristotle on ancient, medieval, and Renaissance poetic theory.

I mentioned earlier the phenomenon which appears in most of our forty-two Greek musical fragments, that the *tonos* (*tropos*) as analyzed *via* the notation used in the Alypian tables is at the same time describable as an octave species analyzable *via* the Aristoxenian system. This same phenomenon was recognized in the early second century A.D. by Claudius Ptolemy. Never one to be stumped by theoretical divergence or contradictory data, Ptolemy (*Harmonics* 2.5) described a mechanism for shifting a piece of music from its notational *tonos* (*tropos*) to its thetic, or practical,

<sup>&</sup>lt;sup>23</sup>He says that some Harmonists list the *tonoi* (ascending) as Hypodorian, Mixolydian, Dorian, Phrygian, Lydian, others as Hypophrygian, Hypodorian, Mixolydian, Dorian, Phrygian, Lydian, and others with different intervals between these five or six *tonoi*.

<sup>&</sup>lt;sup>24</sup>There is ample evidence for this in the testimonia found in Rosetta da Rios, *Aristoxeni Elementa harmonica* (Rome, 1954) 95-136.

octave species. The Mesomedes Hymns to the Muse and to Calliope (II A.D.) are in the Lydian *tonos* (by notation) but in the Dorian octave species by thetic shift. The Seikilos inscription of the first century A.D. is in the Ionian *tonos* (by notation) but in the Phrygian octave species by the thetic shift. The Berlin paean is in the Hyperionian *tonos* by notation but in the Hypodorian octave species by thetic shift. Since Aristoxenus refused to employ the notational system(s) developed most probably as early as the fifth century B.C.—he despised the use of notation as a pedagogical device—his theoretical, perfect systems were developed apart from the notational, and the two needed at some point to be reconciled in the theoretical treatises. This was part of Ptolemy's contribution.

What I have done here amounts probably to an inferior Chailleyesque stab at establishing a chronological development for various systems of musical theory possibly so complex that any ancient theorist or musician would simply dismiss my summary of their developmental history as typical neo-neo-Aristoxenian nonsense. But my belief that the world of ancient Greek music is, characteristically for all of ancient Greek culture, a confusing, inconsistent, contradictory one, especially in the sixth, fifth, and fourth centuries, B.C., is strong. It is so strong that I am able to reconcile all the harmoniai, tonoi, and octave species only so far as I can reconcile the calendars of Athens and Corinth or the republican democracy of Athens and the dual monarchy of Sparta. There is no doubt that ancient theorists of government recognized such differences and tried to reconcile them as part of a great cycle of government revolving through democracy, tyranny, and oligarchy.<sup>25</sup> I therefore assume that ancient theorists of music recognized a similar difference between the various musics of Greece—Aristoxenus (#37) says as much in introducing the varieties of tonoi—and that they then tried to reconcile these differences. Their solutions differ greatly. and most of the music and theoretical evidence is lost. We do the best we can with a fraction of the total music that was actually written down in antiquity. But to judge from what evidence we do have, I would hazard a guess that the *tonos* and the octave species in Cleonides (ex Aristoxeno) were two very different entities, one an attempted standardization of actual national musics, the other an analytical device developed from Eratocles but which became part of the standardized music for subsequent generations.

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<sup>&</sup>lt;sup>25</sup>As described, for example, in Book 8 of Plato's Republic.



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# HARMONIA AND ETHOS IN ANCIENT GREEK MUSIC

#### THOMAS J. MATHIESEN

The study of ancient Greek music has held the interest of modern scholarship since the Renaissance, when the widely attested powers of ancient music began to attract the attention of a number of the humanists. From the very first, two subjects within the field of ancient Greek music were seen as especially troublesome and were given particular scrutiny. These are the subjects of harmonia and ethos. The difficulty with these subjects lies in part in the fact that ancient authorities disagree among themselves, and it has therefore seemed that the subjects must remain forever in the realm of philosophical dispute, eluding all attempts at systematization. This is not to say that scholars ignored the subjects. In fact, there have been a number of notable works dealing with these matters, including Girolamo Mei's unpublished De modis musicis antiquorum (autograph in Vaticanus latinus 5323)—dating from the sixteenth century, the beginning of modern scholarship on ancient Greek music—and, more recently, studies by Hermann Wiegandt, A. F. Walter, Hermann Abert, E. M. von Hornbostel, L. P. Wilkinson, James Riley, Edward Lippman, Warren Anderson, J. García López, and Lukas Richter. All these works are incisive and combine technical remarks about modes, scales, pitches, and so on, with general philosophical treatments of music and character, but none of these—nor any of the other studies that might be cited—attempts to systematize the ethical characteristics of ancient Greek music or to show a close relationship between harmonia and ethos. Nonetheless, it is possible to develop and demonstrate a reasonably precise system for the analysis of the ethos in pieces of ancient Greek music. This system leans heavily on the *De musica* of Aristides Quintilianus, which unquestionably provides the most detailed and comprehensive ancient treatment of the subjects of har-

<sup>&</sup>lt;sup>1</sup>Hermann Wiegandt, "De ethico antiquorum rhythmorum charactere auctore Aristide Quintiliano" (Ph.D. diss., Halle, 1881); Anton Friedrich Walter, "Die ethisch-pädagogische Würdigung der Musik durch Plato und Aristoteles," *Vierteljahrsschrift für Musikwissenschaft* VI (1890), 388–415; Hermann Abert, *Die Lehre vom Ethos in der griechischen Musik* (Leipzig, 1899; reprint ed., Tutzing, 1968); Erich M. von Hornbostel, "Tonart und Ethos," *Festschrift für Johannes Wolf zu seinem sechzigsten Geburtstag*, ed. W. Lott, H. Osthoff, and W. Wolffheim (Berlin, 1929), pp. 73–78; L. P. Wilkinson, "Philodemus on Ethos in Music," *Classical Quarterly* XXXII (1938), 174–81; James Riley, "Ethos in Greek Music" (M.M. thesis, College-Conservatory of Music of Cincinnati, 1948); Edward Lippman, *Musical Thought in Ancient Greece* (New York, 1964; reprint ed., New York, 1975); Warren Anderson, *Ethos and Education in Greek Music* (Cambridge, Mass., 1966); J. García López, "Sobre el vocabulario etico-musical del Griego," *Emerita, boletín de linguística y filología clásica* XXXVII (1969), 335–52; and Lukas Richter, "Antike ästhetische Theorien zur gesellschaftlichen Funktion der griechischen Tragödie," *Die griechische Tragödie in ihrer gesellschaftlichen Funktion*, ed. Heinrich Kuch, Veröffentlichungen des Zentralinstituts für Alte Geschichte und Archäologie der Akademie der Wissenschaften der DDR, XI (Berlin, 1983), 173–92.

monia and ethos, and which pulls together all the various disciplines—philosophy, harmonics, metrics, psychology, and cosmology—that bear on these subjects.

In order to explain the system, it will be necessary first to treat the concept of harmonia. The notion of mimesis, especially as it is formulated by Aristides Quintilianus and the Platonists, must then be reviewed. With this as background, the analytical system may be extracted from the treatise of Aristides Quintilianus and applied to three early fragments of ancient Greek music. Some preliminary conclusions will then emerge.

#### Harmonia

A full and systematic discussion of the term harmonia—even limited to its use in ancient Greek music theory—would extend far beyond the limits of this paper. Because my discussions have already appeared elsewhere, it will be most expeditious to make some straightforward statements about harmonia that will be necessary for our understanding of the larger subjects in view.

Harmonia in ancient Greek music theory must be understood on two levels, depending on the approach (or, perhaps, on the sophistication) of the theorist. Theorists primarily concerned with music as an analogue for higher philosophical truths conceive the harmonia as manifesting certain basic proportions, orders, and characters mimetic of higher universals, even when applying the term to certain scales or genera, which are seen as analogues. This more comprehensive usage appears in the treatises of Aristoxenus (e.g., Harmonica 1.2, 4, 16, and 26), [Ps.-] Plutarch (e.g., De musica 34 [1143E]), Ptolemy to some degree (e.g., Harmonica 3.3-7, 10-11), and especially Aristides Quintilianus (De musica 1.1, 3, 8, 11-12, 19; 2.4, 6, 7, 12, 14, 16-17; and 3.6, 9, 12, 22, and 27). It must be stressed that these usages occur in proximity to usages of terms like enharmonios, tonos, eidos, tropos, and so on; thus, harmonia may not be considered a simple synonym for these other technical terms, though it does subsume these technical concepts. On the other hand, theorists representing the second-century revival of ancient theory (such as Cleonides and Gaudentius) who seem to have viewed music essentially as a system rather than as a "consort of philosophy"—as Aristides Quintilianus refers to it—tend to concentrate on the limited technical sense of harmonia, while remaining aware (to a greater or lesser degree) of the larger perspective.<sup>3</sup>

<sup>&</sup>lt;sup>2</sup>Thomas J. Mathiesen, "Problems of Terminology in Ancient Greek Theory: 'APMONÍA," Festival Essays for Pauline Alderman, ed. Burton Karson (Provo, 1976), 3–17; and idem, Aristides Quintilianus on Music in Three Books, Music Theory Translation Series (New Haven, 1983), pp. 42–57. See also useful articles by Kathleen Schlesinger, "The Harmonia," Music Review V (1944), 7–39 and 119–41; Isobel Henderson, "The Growth of the Greek ἀρμονίαι," Classical Quarterly XXXVI (1942), 94–103; and Olof Gignon, "Zum antiken Begriff der Harmonie," Studium generale XIX (1966), 539–47; and the still indispensable monograph of Bonaventura Meyer, APMONIA. Bedeutungsgeschichte des Wortes von Homer bis Aristoteles (Zürich, 1932).

<sup>&</sup>lt;sup>3</sup>Mathiesen, "Problems," pp. 3–4, 17.

It is therefore necessary to keep in mind when studying ancient Greek music theory that a harmonia is not a harmonia. The same may be said, by the way, for some of the other technical terms that appear throughout the Greek theoretical tradition. Greek musical theorists are not separate from their philosophical or technical context, and their treatises must be studied in a larger intellectual context if one is to understand them. Historians of music theory have realized this for many years in connection with terminology in medieval and Renaissance music theory, but the lesson has been all too rarely applied to ancient Greek music theory.

Harmonia in its fullest sense, then, is a unification of things that appear on a lower level to be dissimilar or unrelated or lacking in order. This sense of the term appears clearly in the *Phaedo* and *Timaeus* of Plato, in *Politica* 8.5 (1340b18-19) and De anima 1.4 of Aristotle, in Plutarch's De animae procreatione in Timaeo, and in the musical treatises as well, for instance in Aristides Quintilianus *De musica* 3.6. Thus, to choose three examples, the octave is a harmonia (cf. Aristides Quintilianus De musica 1.8; 2.12), a proportion like 2:4:8 (which may also produce octaves) is a harmonia (cf. Aristides Quintilianus De musica 3.6), and a tonos is a harmonia (cf. Aristides Quintilianus De musica 1.10; 2.14). Each of these provides a unification and an order for lower level entities such as dissimilar numbers, groups of notes, or rhythmic patterns. From this definition, it should be easy to see two things: (1) how less sophisticated theorists (and some modern commentators) began to think of tonos and octave species as synonymous with harmonia, and (2) while an octave, a proportion, or a tonos are harmoniai, the converse is not true: harmonia is not an octave, a proportion, or a tonos.

Given this general definition for harmonia, it will not be surprising to discover that the term is also used in connection with cosmology, ethics, metaphysics, and other branches of Greek philosophy. Moreover, the term often appears in passages where musical parallels are explicit, as for instance in the *Phaedo*, noted above. This is important because it might otherwise be assumed that the term is being used metaphorically or at least in a sense unrelated to music. But if harmonia as a concept might relate divergent branches in Greek philosophy, it may be possible to discover how that much-vaunted power of ancient Greek music—the ability to convey and affect ethos—actually worked. In fact, this relationship of divergent philosophical branches through harmonia is one of the central features of the treatise of Aristides Quintilianus,<sup>4</sup> and the treatise provides a means for distilling a system to analyze the ethical quality of a composition.

Aristides Quintilianus and Platonic notions of mimesis

The treatise of Aristides Quintilianus is quite unlike other ancient Greek musical treatises in that it is not a technical work but rather an elaborate

<sup>&</sup>lt;sup>4</sup>This matter is discussed at length in my Introduction to Aristides Quintilianus, pp. 14-57.

work of philosophy that attempts to show how music through harmonia provides a comprehensible model for understanding physical and metaphysical realities and thus for attaining higher knowledge through philosophy. The treatise begins with a study of the technical details of harmonics, rhythmics, and metrics; proceeds to a consideration of the effect of music on character; and concludes with an exegesis of number, the soul, and the order of the universe. Since all of these sections are related cumulatively in the most intricate way, the concluding sections naturally provide reasons for the powers and phenomena observed in the earlier sections.<sup>5</sup>

It has long been observed in general terms that the Platonic notion of mimesis is in some way related to music's power to affect and effect ethos. Indeed, one might even say that the notion of mimesis is fundamental to the notion of musical ethos, at least in the ancient Greek sense. It is therefore necessary at this point to review mimesis as the process through which harmonia imbues music and through which ethos is developed in response to music.

The concept of mimesis is exceedingly difficult to condense, despite the important work by S. H. Butcher, Hermann Koller, Paul Moraux, and Gerald F. Else. Nevertheless, Aristides Quintilianus once again provides a great deal of help in his rather specific remarks about mimesis in music. *De musica* 2.4 points out that since the soul is naturally attracted to whatever is like one or another of its parts, mimetic arts may affect the soul. The notion of the soul's attraction is based—perhaps—on Plato's *Timaeus* and *Sophista*, but it is also considered in Aristotle's *Metaphysica* 1.6. The parts of the soul, of course, are the rational and irrational parts—the latter further divided into the thymic (or, aggressive) and epithymetic (or, indulgent) parts (these are elegantly characterized in Plato's *Phaedrus* 245-248 and *Timaeus* 41E-42D). Musical mimesis is especially powerful, according to Aristides Quintilianus, because it is not a simple imitation of things but is rather an imitation of life itself, capable of raising the soul once again to the harmonia of the universe:

The reasons for music's actuality are apparent. For inasmuch as our first learning comes through similarities, which we conjecture by attending to our sensory perceptions, painting and sculpture teach only through vision and the likeness both excites and amazes the soul; how then could music fail to captivate, since it makes its mimesis not through one sensory perception but through many? Even poesy uses hearing alone through pure diction, but it does not always move passion without melody or adapt it to the underlying matters without rhythms. For instance, if ever it is necessary to move passion in accord with the interpretation, such a thing does not result without slightly altering the voice in the

<sup>&</sup>lt;sup>5</sup>*Ibid.*, pp. 14–15.

<sup>6</sup>S. H. Butcher, "'Imitation' as an Aesthetic Term," Aristotle's Theory of Poetry and Fine Art with a Critical Text and Translation of the Poetics, 4th ed. (London, 1911; reprint ed., New York, 1951); Hermann Koller, Die Mimesis in der Antike (Bern, 1954); Paul Moraux, "La 'mimesis' dans les théories anciennes de la danse, de la musique, et de la poésie," Etudes classiques XXIII (1955), 3–13; and Gerald F. Else, "Imitation' in the Fifth Century," Classical Philology LIII (1958), 73–90. Note also the useful article by W. Tatarkiewicz, "Mimesis," Dictionary of the History of Ideas, 5 vols., ed. Philip P. Wiener (New York, 1973), III, 225–30.

direction of melody. Only music teaches both by word and by the counterparts of actions, not through motionless bodies or those fixed in a single form, but through animate bodies, of which it alters both the figure and the motion to the kindred form in accord with each of the actions recited. These things are evident both from the dance of the ancient choruses, the trainer of which is the science of rhythmic, and from the things written down by many authors about delivery. Those arts having materials that are special may not lead quickly to a notion of the action, for to some the colors, to others the mass, and to still others the phrase have suggested things alien to the truth. But music persuades most palpably, for it makes its mimesis with such means as happen also to carry out truthfully the actions themselves. Since in the usual order of things, will leads, word follows, and thereafter action is accomplished, music imitates the ethoses and passions of the soul in the notions, the words in the harmoniai and the molding of the voice, and the action in the rhythms and motion of the body.<sup>7</sup>

In *De musica* 3, Aristides Quintilianus shows how all the parts of music—pitch, scale, tonos, rhythmic pattern, and so on—are like the order of the universe, and therefore through mimesis, music may make the order of the soul like the order of the universe. Thus, the harmonia of music may create a like harmonia in the soul, and this in turn creates a particular ethos. In *De musica* 2.14, Aristides Quintilianus states:

By using the harmoniai in the aforesaid ways—either presenting a harmonia to each soul by similarity or contrariety—you will disclose the inferior ethos lying hidden, heal it, and instill a better one. You will persuade, if ignobility and stiffness should lurk, by leading through a middle state to the opposite condition; and if refinement and usefulness should be present, by augmenting them through similarity in symmetrical proportion . . . .

As I said, the harmoniai are like dominating intervals or surrounding notes, and these are like the movements and affections of the soul. That notes, even of continuous melody, mold through similarity a nonexistent ethos in children and in those already advanced in age and bring out a latent ethos, the disciples of Damon showed. In the harmoniai transmitted by him, it is possible to discover that sometimes the feminine, sometimes the masculine of the movable notes either dominate or have been employed to a lesser degree or not at all, since it is evident that a harmonia is utilized in accord with the ethos of each soul.<sup>8</sup>

With this sense of the mimetic power of music, it is now possible to see the sort of analytical system that might be distilled from Aristides Quintilianus' treatise. The descriptions of ethos, harmonia, the technical parameters of music, and the musical psychology are so consistent throughout the treatise that they may be arranged and classified as shown in Table 1 below

The table illustrates two of the indispensable components of any piece of Greek music: rhythm and melos.<sup>9</sup> These components are further subdi-

<sup>&</sup>lt;sup>7</sup>Aristides Quintilianus *De musica* 2.4 (trans. from *Aristides Quintilianus*, pp. 118–19).

<sup>&</sup>lt;sup>8</sup>Aristides Quintilianus De musica 2.14 (trans. from Aristides Quintilianus, pp. 144-45).

<sup>&</sup>lt;sup>9</sup>Melos is the combination of words, melody, gesture, and rhythm (see Aristides Quintilianus *De musica* 1.12 and Mathiesen, "Problems," pp. 5–6).

vided into masculine, feminine, and medial characteristics. By applying these characteristics to the musical fragments, a dominant ethos may be determined in the fragment, and it may then be considered whether this ethos would match the character and function that might be assumed from a study of the text of the fragment.

# Application to the fragments

Any number of fragments might be chosen for analysis, but it would surely be best to concentrate first of all on the two earliest surviving fragments, since they are most likely to exhibit the classical conceptions of harmonia and ethos described by Aristides Quintilianus. These two fragments are P. Wien G2315 and P. Leiden Inv. 510, both dating from the third century B.C. and both ostensibly preserving music from Euripides' *Orestes* and *Iphigenia in Aulis*. <sup>10</sup>

Figure 1 exhibits a transcription of P. Wien G2315,<sup>11</sup> which preserves *Orestes* 338-344; a table of the notes found in the fragment and their relation to the harmoniai given in Aristides Quintilianus' *De musica* 1.9; and a full analysis of the fragment, following Aristides Quintilianus' system, as shown in Table 1.

In the analysis, the melos has been shown on two levels: that of melos vowels and that of the notes themselves and the tonoi, scales, and octave species they imply.

The rhythmic area reveals fifty-five masculine elements, sixty-nine feminine elements, and twenty-nine medial elements (note the summary to Figure 1). This would seem to provide generally a medial ethos, with perhaps a slight feminine emphasis. In rhythmic terms, the composition is ambiguous in ethos.

A different picture emerges from the melos. Ignoring for the moment the notes themselves, one finds fifty masculine and medial masculine elements (i.e., thirty-four masculine melos vowels and sixteen medial masculine melos vowels), with only twenty-one feminine and medial feminine elements. This would seem to convey a decidedly masculine ethos. Only a small portion of the notation remains, but as a random sample, it may be statistically valid. Here again, a review of Table 1 will show that the stationary notes are medial in character, while the movable notes are either

<sup>&</sup>lt;sup>10</sup>The matter of the proper transcription of these fragments is, of course, significant to any study of ethos, but it must be assumed for the present that the published transcriptions of the fragments are at least reasonably accurate. The *Orestes* fragment appears in Egert Pöhlmann, *Denkmäler altgriechischer Musik*, Erlanger Beiträge zur Sprach- und Kunstwissenschaft, XXXI (Nürnberg, 1970), pp. 78–82; the *Iphigenia in Aulis* fragment appears in Thomas J. Mathiesen, "New Fragments of Ancient Greek Music," *Acta musicologica* LIII (1981), 14–32.

<sup>&</sup>lt;sup>11</sup>In the transcription, I have added the rhythmic values (Pöhlmann transcribes the piece with note heads alone) indicated by the rhythmic notation and the rhythmic values of the text and have changed the low instrumental note (☐) from the F# of Pöhlmann's transcription to an E, which is the proper reading for this Greek notational symbol.

TABLE 1

Characteristics of Ethos in Ancient Greek Music Based on the System of Aristides Quintilianus

Masculine	RHYTHM (masculine) Feminine	<u>M</u> edial	
Long vowels $(\eta, \omega)$	Short vowels $(\epsilon, o)$	Dichrona $(\alpha, \overline{\iota, \upsilon})$	
Rough mutes $(\vartheta, \varphi, \chi)$	Smooth mutes $(\varkappa, \pi, \tau)$	Medial mutes $(\beta, \gamma, \delta)$	
Double consonants $(\zeta, \xi, \psi)$ and spirant $(\sigma)$ Feet dominated by long syllables	Liquids (λ, μ, ν, ρ) Feet dominated by short syllables	Composite feet	
	MELOS (Feminine)		
Masculine	Feminine	Medial	
Vowels o and ω	Vowels $\epsilon$ and $\eta$	Vowels $\alpha$ (more masculine), $\iota$ and	
Lichanoid notes (lichanos hypaton, lichanos meson, paranete synemmenon, paranete diezeugmenon, paranete hyperbolaion)  Scales bounded by masculine notes  Gapped scales with predominantly masculine notes	Parhypatoid notes (parhypate hypaton, parhypate meson, trite synemmenon, trite diezeugmenon, trite hyperbolaion)  Scales bounded by feminine notes  Gapped scales with predominantly feminine notes	v (more feminine) Stationary notes (proslambanomenos [more feminine]; hypate hypaton and hypate meson [more masculine]; mese followed by diezeugmenon [more feminine]; mese followed by synemmenon [more masculine]; and paramese, nete synemmenon, nete	
Dorian mode Instruments pitched from F to B <sup>b</sup>	Lydian mode Instruments pitched from b <sup>b</sup> to b <sup>b'</sup>	diezeugmenon, and nete hyper- bolaion [more masculine]) Scales bounded by medial notes Gapped scales with predominantly medial notes Phrygian mode Instruments pitched from Bb to ab	

Figure 1. Analysis of P. Wien G2315 (Euripides *Orestes* 338-344) According to the System of Aristides Quintilianus

		Alypius symbols		Aristides Quintilianus	
Dynamic names		vocal	instru- mental	Dorian	Phrygian
				a' $\Theta$	
paranete diezeugmenon	g'		Z	g' f' A	Lſ
trite diezeugmenon	f'	E		$\mathbf{f}'  \Delta$	$\Delta$
paramese	e'	Z		e'* E	E
mese	ď′	I		e' Z	Z
chromatic lichanos meson	b	$\pi$	Э	d' I	I
parhypate meson	$b^b$	P		а# П	П
hypate meson	a	C		a* P	P
lichanos hypaton	g	Φ		a C	C
				g Ф	Φ
hypate hypaton	e		7		



Text Matolopúpopat L patépos aépa ods,

Rhythm DFFDFM DFF MD M

Melos mMMfMM mFM Mm M

Notes MFm FMM



 Text
 δ σ' ἀναβακχεύει. Τι ὁ μέγας ὅλβος οὐ

 Rhythm
 F
 D D M
 M M
 F F D M
 F M

 Melos
 M
 m m m
 F F
 M F m
 M M
 M

 Notes
 m m m
 f m F



Text μόνιμος έμ βροτοῖς, τανὰ δὲ λαῖφος ως

Rhythm F D F M F M D D F M F M

Melos M f M F M m m F M M. M

Notes M F m f m



 Text
 τις ἀχάτου
 θοᾶς
 τινάξας
 δαίμων

 Rhythm
 D
 D
 D
 FM
 D
 M
 M
 M

 Melos
 f
 m
 m
 M
 M
 f
 m
 M
 M

 Notes
 m
 F
 M
 m
 M
 m



 Text
 κατέκλυσεν
 ) ٦ )
 δεινῶν

 Rhythm
 D M
 D M
 M M

 Melos
 m F
 f F
 F M

 Notes
 M M
 F M



בר ( עשיפא Text Rhythm MM Melos M M MM M Notes mf



λάβρους όλεθρίου τ Text σιν εέν χύμασιν M F M D M D FF D D D Rhythm Melos M M F f M FF f m f Notes ММ m Fm ? M

# Key

= medial dichrona D

M = masculine

= feminine

= medial masculine

= medial feminine

### Summary

## Masculine

5 rough mutes

19 double consonants and spirants

31 masculine syllables

- 34 masculine melos vowels

12 masculine notes

## Feminine

16 smooth mutes

34 liquids

19 feminine syllables

12 feminine melos vowels

8 feminine notes

## Medial

8 medial mutes

21 medial syllables

L<sub>16</sub> medial masculine melos

vowels

9 medial feminine melos vowels

14 medial masculine notes
3 medial feminine notes
Tonos: Lydian
Octave species: Phrygian
Scale bounded by masculine notes
Rhythmic pattern: dochmiacs (mixed)

masculine or feminine. The medial notes may have a masculine or feminine inflection. <sup>12</sup> The notation in this fragment shows twenty-six masculine and medial masculine elements, and only eleven feminine and medial feminine elements. It immediately strikes one that the notational proportion complements almost perfectly the ratio of melos vowel elements. The proportion 26:11 is almost identical to the proportion 50:21. In terms of the melos, therefore, the ethos of this part of the chorus is decidedly masculine.

How does the rhythmic pattern relate? The rhythm (or meter, if one perfers) of the fragment is dochmiac. Aristides Quintilianus' *De musica* considers this to be a "mixed rhythm" and states (2.15) that these types of rhythms create a disordered affect. Aristides Quintilianus does not assign specific masculine, feminine, and medial characteristics to rhythmic patterns (except in the general terms shown in Table 1); he ascribes instead certain affects to them. Thus, rhythmic elements convey characters, while patterns convey affects. So, although the rhythmic elements provide a medial ethos, the rhythmic pattern conveys an affect of disorder.

Finally, there is the matter of tonos. The tonos of the fragment is generally considered to be Lydian. The octave species, which has not received much attention in published treatments of this fragment, is probably Phrygian (though Dorian and Mixolydian are also possible, if the instrumental notes are included in the pattern), and—as an interesting coincidence—the notes of the fragment also match the Phrygian and Dorian harmoniai given by Aristides Quintilianus' *De musica* 1.9, where he states that these are "exceedingly ancient." If the tonos dominates the ethos, there is a feminine ethos here. But if it is the harmonia and if the harmonia in this fragment is Aristides Quintilianus' Dorian or Phrygian (the latter matching the octave species), there is either a masculine or medial ethos.

Some conclusions may now be drawn from the data. The rhythmic elements are medial in ethos, the melos elements are decidedly masculine, the rhythmic pattern creates a disordered affect, and the harmonia is masculine or medial. Thus, the fragment would seem to convey a masculine ethos with some mediation and an agitated affect.

How does this character match the character and function of this chorus in the tragedy? The fragment comes from a point near the beginning of the tragedy. Electra has dominated the first scene, along with a chorus of Argive

<sup>&</sup>lt;sup>12</sup>The characters assigned in Table 1 come from the various characters assigned to vowel sounds in Aristides Quintilianus *De musica* 2.11–13 and the use of some of these vowels in a solmization system to sing each note of the Perfect Immutable System, as described in *De musica* 2.14. See *Aristides Quintilianus*, pp. 33–34 and 139–46.

maidens. Orestes is also present in a frenzied state. Electra tells Orestes that Menelaus has arrived and is coming to see him. After she exits, the chorus begins, a chorus of anguish and weeping, full of disordered images of struggle and question that fit the agitated dochmiacs with their many successive short syllables. But the chorus also serves to introduce Menelaus. The masculine ethos would therefore seem appropriate to the appearance of Menelaus, and the disordered affect foreshadows Menelaus' own agitation expressed in his opening speech. It would be premature on the basis of one example to draw a firm conclusion about the relationship of musical and dramaturgical ethos in this chorus, but one might at least say that the ethoses seem reasonably cohesive. Another fragment may provide additional evidence.

Figure 2 exhibits a transcription of P. Leiden Inv. 510, which preserves *Iphigenia in Aulis* 783-796; a table of the notes found in the fragment; and a full analysis of the fragment, once again following Aristides Quintilianus' system as shown in Table 1. The analysis follows the same pattern used for the *Orestes* fragment.

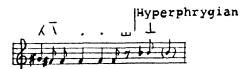
Figure 2. Analysis of P. Leiden Inv. 510 (Euripides *Iphigenia Aulidensis* 783-796, According to the System of Aristides Quintilianus

		Alypius	symbols	
Dynamic names		Hyperaeolian	Нур	erphrygian
chromatic paranete diezeugmenon	b <sup>b</sup> ′	1		
nete synemmenon			b <sup>b</sup> ′	$\top$
diatonic paranete synemmenon			a <sup>b</sup> ′	ん
chromatic paranete synemmenon	g#'	Ł		
trite synemmenon	g'	U		
paramese			g'	U
mese	f#′	A or /	f′	S
diatonic lichanos meson	e'	[		
parhypate meson	ď'	I		
diatonic lichanos hypaton	b	O	b <sup>ь</sup> ,	Π
chromatic lichanos hypaton	b <sub>b</sub> ,	Π		
parhypate hypaton	a	C		
hypate hypaton	g#	T		





οιαν αι πολύχρυσοι Λυδαί και φρυγών άλοχοι στήσουσι παρά ίστοις μυθεύσαι Text Rhythm MD F M D D DM DF M M M D D D M D M M Melos Mm Mf f Μ ſ f M m M M F M f m m f f F M 14 Notes M m Mm





ταάς γάς παι ρίας όλομένας άπολωτιεί; δια σέ, ταν κύκυου δολιχαύχενος γόνον, Text Rhythm DD FFFD DFMDM M FD N F M Melos MMFm mMMfF fm F f M M f M F M М fm mm m Notes mm m m Mm 14 m

# Key

D = medical dichrona

M = masculine

F = feminine

m = medial masculine f = medial feminine

#### Summary

# Masculine

77 rough mutes
20 double consonants and
spirant
43 masculine syllables
33 masculine melos vowels
10 masculine notes

#### Feminine

95 28 smooth mutes 41 liquids 26 feminine syllables 24 feminine melos vowels

5 feminine notes

#### Medial

> Tonos: Hyperaolian and Hyperphyrygian Octave species: Mixolydian Scale bounded by medial notes Rhythmic pattern: choriambic (composite)

In the area of rhythm, there are seventy masculine elements, ninety-five feminine elements, and thirty-six medial elements (note the summary to Figure 2). Here again, this would seem to imply a medial ethos, with a slight feminine emphasis. In rhythmic terms, the ethos of the fragment is ambiguous, but somewhat feminine.

The melos, as was the case with the *Orestes* fragment, shows a masculine ethos in the fifty-five masculine and medial masculine elements (i.e., thirty-three masculine melos vowels and twenty-two medial masculine melos vowels) and forty-one feminine elements (i.e., twenty-four feminine melos vowels and seventeen medial feminine melos vowels). This is certainly less markedly masculine than the *Orestes* fragment. In this fragment, too, only a small portion of the notation survives, but it may claim statistical validity. There are twenty-nine masculine and medial masculine notes, as against only five feminine notes. There are no medial feminine notes at all. If one considers the melos vowels and melos notes together, eighty-four masculine and medial masculine elements and forty-six feminine elements appear. So far the ethos of this fragment is less clear than that of the *Orestes* fragment.

The rhythmic pattern of the fragment is choriambic. Aristides Quintilianus considers this pattern to be composite by conjunction, which—as can be seen from Table 1—creates a medial ethos. The predominance of long syllables, however, conveys a more masculine quality (note *De musica* 1.23, 26; 2.15), and this matches, as will be shown, the solemn nature conveyed by the prayer in this part of the chorus.

The tonos of the fragment is Hyperaeolian and Hyperphrygian; the octave species appears to be Mixolydian, which according to Aristides Quintilianus' *De musica* 1.9 is threnodic or feminine.

The conclusions that can be drawn about this fragment are less consistent than those for the *Orestes* fragment. The rhythmic elements are medial in ethos with a feminine emphasis, the melos elements are more masculine by far (though the relationship of the melos vowels and melos

notes is not as precise as it was in the *Orestes* fragment), the rhythmic pattern creates a medial quality with some masculine emphasis, and the harmonia and tonos are clearly feminine. Thus, the fragment would seem to be medial because of the dominant feminine harmonia and the masculine melos combined with the medial rhythmic pattern.

A consideration of the function of this chorus in the tragedy may help in understanding the ambiguity of the ethos. The chorus' function is problematic in this work because the chorus appears in one place in the manuscript tradition and another place in the papyrus, unless the papyrus represents some sort of anthology with the solo and choral parts not necessarily in the proper order. Adding to the problem is the fact that it is not certain whether Euripides finished this tragedy or whether some of it is spurious. *Iphigenia in Aulis* was produced posthumously and scholars have questioned the authenticity of some parts of the work. <sup>13</sup>

In the manuscript tradition for Iphigenia in Aulis, the chorus precedes the first appearance of Achilles; in the papyrus, the chorus follows the departure of Iphigenia to be sacrificed. If the manuscript tradition is correct, one might expect by analogy with the Orestes fragment that the chorus would have a masculine ethos to introduce Achilles while at the same time conveying a disordered affect in keeping with the knowledge of Agamemnon's treachery. On the other hand, if the papyrus represents an alternate version of the tragedy (or Euripides' intended order), one might expect the chorus to convey a calmer, neutral ethos in keeping with the grandeur of Iphigenia's decision to accept her sacrifice willingly. Moreover, the text is one of supplication, and the dominance of the long syllables, as has been noted, conveys a quality of solemnity suited to supplication. Iphigenia's heroic quality at this point in the tragedy could thus be emphasized in the masculine ethos of the melos, the lamentation appropriate to the text foretelling the fate of Phrygia in the harmonia, and the dispassionate acceptance of Iphigenia's fate in the rhythmic pattern. If this analysis is correct, it may serve to suggest that this chorus does indeed belong at the end of the tragedy, following line 1509, and to support the appropriateness of the medial ethos conveyed by all the elements of the setting.

It may be objected at this point that the evidence for the ethoses of these two choruses is conflicting and the system therefore does not work. But it must be remembered that Euripides was noted for his unusual and complex approach to tragedy and for his avoidance of stereotyped characters and moods. It should therefore be surprising if a Euripidean chorus conveyed one and only one ethos in all its parts. Moreover, Aristides Quintilianus (*De musica* 2.16) makes it clear that complementary ethoses were the norm rather than a uniform ethos in every part:

<sup>&</sup>lt;sup>13</sup>See G. M. A. Grube, *The Drama of Euripides* (London, 1961), pp. 421, 438; Denise Jourdan-Hemmerdinger, "Un nouveau papyrus musical d'Euripide (présentation provisoire)," *Comptes rendus de l'Académie des Inscriptions et Belles-Lettres* (1973), 292–302; Giovanni Comotti, "Words, Verse and Music in Euripides' Iphigenia in Aulis," *Museum philologum Londiniense* 2 (1977), 69–84; and Mathiesen, "New Fragments," pp. 24–25.

In the perfect actuality of music, a suitable notion is determined, and seemly diction, a scale akin, harmonia of notes, qualities of rhythm, and use of instrument are made homologous. We must apply the perfect types of musical creation when the extreme is in no way harmful. But sometimes we must mix and beware of otherness, lest somewhere, because of the extreme, we unknowingly lead the underlying ethos in the opposite direction. . . . We must make a mixture not through bare opposites (for this is unsuitable and repellent) but rather through harmoniously arranging the means with the extremes: for example, with a masculine scale, not a feminine but rather a medial rhythm; or with a more feminine rhythm, a medial scale and instrument, not only an opposite one; and in like manner for the rest, producing out of masculinity and the middle state or femininity and the middle state a mixture of one with the rest or two or even more with more. <sup>14</sup>

It should also be noted that the two fragments happen to come from tragedies that are generally regarded as unusual in their structure and particularly in their use of chorus. This may, incidentally, also explain why these particular fragments exist. The peculiarity of their character may have necessitated their notation and thus insured their survival. In *Iphigenia in Aulis*, the chorus is unusually passive and plays a largely neutral role. The ethos discovered in the fragment seems to match that neutrality quite well. In *Orestes*, the chorus fills its more usual role in Euripides' work of being directly involved and sympathetic to the main characters. Thus, the more definite ethos in the *Orestes* fragment is to be expected.

The conflicting evidence of the two Euripidean choruses may also lead one to wonder if all the fragments would demonstrate such complexity or ambiguity. A summary of one additional composition may serve to dispel this question. The first segment of the Delphic hymn by Limenios (Delphi Inv. Nr. 489, 1461, 1591, 209, 212, 226, 225, 224, 215, 214)<sup>15</sup> exhibits an altogether feminine ethos. In the rhythmic area, it presents fifty-nine masculine elements, 118 feminine elements, and only eleven medial elements. In the area of melos, it has only seven masculine notes as against thirty-one feminine notes and thirty-six medial notes. It also has fifty-two feminine and medial feminine vowels and fifty-three masculine and medial masculine vowels. It is in a Lydian tonos with a Phrygian octave species, and the rhythm is dominated by short syllables. Except in the area of melos vowels and octave species, which are medial in ethos, the ethos is feminine, which surely fits a text invoking the Muses.

<sup>&</sup>lt;sup>14</sup>Aristides Quintilianus *De musica* 2.16 (trans. from *Aristides Quintilianus*, pp. 150–51). This excerpt reflects the theory of contraries, which operate in mimesis (cf. Aristotle *Metaph*. 10.8 [1058a8–28]); on this excerpt, cf. Plutarch *De musica* 33.

<sup>&</sup>lt;sup>15</sup>The hymn is published in Pöhlmann, pp. 68–76.

<sup>&</sup>lt;sup>16</sup>I.e., there are thirteen rough mutes, thirteen double consonants and spirants, and thirty-three masculine syllables (totaling fifty-nine masculine elements); and, on the other hand, there are thirty-one smooth mutes, fifty-two liquids, and thirty-five feminine syllables (totaling 118 feminine elements).

### Conclusion

It may be argued that an analysis of ethos based on so many minute details has no chance of illuminating a truly functional effect in pieces of music because audiences could not possibly grasp or be affected by such minutiae. Yet this argument may easily be defeated. It is known from early treatises such as Dionysius of Halicarnassus' De compositione verborum, Ps.-Longinus' De sublimitate, and various works of Hephaestion—not to mention the technical observations of Plato and Aristotle—that the Greeks had an extraordinarily subtle sense of their language. This subtlety has also been admirably demonstrated by modern scholars, especially by W. B. Stanford and W. Sidney Allen. 17 It is also known from the writings of Plato, Aristotle, Philodemus, Sextus Empiricus, and others that the Greeks did perceive the ethos conveyed by theatrical works and music and that they were concerned with this subject. 18 Finally, it might be noted that the affective or ethical quality of such musical features as keys, modes, rhythms, and even pitch vibrations was still observed and seriously treated by modern philosophers like Leibniz—who proposes that the soul, in listening to music, unconsciously counts the beats of the tones, compares their mathematical ratios, and appreciates the mathematical relationships as "un arithmétique occulte", 19—and by systematic theorists at least as late as Daniel Gottlob Türk and Johann Philipp Kirnberger. 20 It is not, of course, the individual minute elements of any composition, ancient or modern, that convey ethos, but rather their collective effect.<sup>21</sup>

Harmonia and ethos in ancient Greek music are inextricably linked and overarch the whole body of *mousike*. By studying the fragments with the aid of Aristides Quintilianus' system, it may be possible to come closer to an understanding of the special power and beauty of both the music—even in its fragmentary state—and the theory.

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<sup>&</sup>lt;sup>17</sup>W. B. Stanford, *The Sound of Greek: Studies in the Greek Theory and Practice of Euphony*, Sather Classical Lectures, XXXVIII (Berkeley, 1967); and W. Sidney Allen, *Accent and Rhythm: Prosodic Features of Latin and Greek: A Study in Theory and Reconstruction*, Cambridge Studies in Linguistics, XII (Cambridge, 1973).

<sup>&</sup>lt;sup>18</sup>Note especially Aristotle *Politica* 8.5 (1340a1-b19); Philodemus and Sextus Empiricus take a skeptical view of ethos, but their denial nonetheless affirms the prominent place of musical ethos in Greek thought.

<sup>&</sup>lt;sup>19</sup>"Remarks on an Extract from Bayle's Dictionary," *Philosophischen Schriften*, ed. C. J. Gerhardt, 7 vols. (Berlin, 1880), IV, 550.

<sup>&</sup>lt;sup>20</sup>Daniel Gottlob Türk, *Klavierschule* 6.3 (*School of Clavier Playing*, trans., introduction, and notes by Raymond H. Haggh [Lincoln, 1982], pp. 337–53); Johann Philipp Kirnberger, *Die Kunst des reinen Satzes in der Musik* 2.2, 4 (*The Art of Strict Musical Composition*, trans. by David Beach and Jurgen Thym, introduction and notes by David Beach, Music Theory Translation Series, 4 [New Haven, 1982], pp. 314–46, 375–417).

<sup>&</sup>lt;sup>21</sup>Note Plutarch *De musica* 33–36.



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# Hellenic Conceptions of Harmony

# By EDWARD A. LIPPMAN

THAT THE WORLD is characterized by ordered structure is a feeling apparently shared by all higher cultures; and in any particular instance, the way in which this feeling is expressed, the kind of beliefs to which it gives rise, must constitute a feature of the culture that is important and distinctive, if only because it is so fundamental. In ancient Greece, the notion of natural order was shaped by thought of such vigor and universality that there could be no question of confining it within the bounds of natural philosophy; it came to be vitally important also to conceptions of man and society and art. It is doubtless because of the commanding position held by this idea that the constitution of works of art or of society was seen less as a contrivance of man than as a reflection of nature, and many aesthetic problems never came into the focus of attention. But the reverse process (which is foreshadowed in animism and myth) was important too: the natural world was viewed in terms of life and mind, its order testified to plan and reason and divinity, or to the idea of organic wholeness that is embodied in the concept of cosmos. Thus the interrelation of man and the world brought ideas of natural order into the human province and infused ethical and religious and aesthetic values into the sphere of nature. In addition, this generalized order was distinguished by a musical character, and was typically thought of as harmonic. Why this was so or how it came about is not easy to determine, but strangely enough, synesthetic and mythical factors involving actual sonority do not seem to play a major role, for the harmony of the world is a rational and abstract property that is different in principle from any concrete manifestation to sense.

Yet harmony does not necessarily involve either number or measurement. It means simply "fitting together," as manifested typically in carpentry in the joining of two pieces of wood, and the basic prerequisite of the conception is thus the existence of two or more distinguishable entities somehow capable of mutual adjustment. From the beginning the idea was connected with music. The process of fitting together is peculiarly applicable to spatial or simultaneous constituents, and Greek music was purely melodic; but in the tuning of the lyre there existed a simultaneity that was possibly not just an example but the true model of the whole conception. Given a world replete with internal relationships, music can easily account not only for the mathematical meanings of har-

mony, but for the entire generality of the term that develops as part of a progressive musicalization of every aspect of experience. For music conspicuously contains the factor of agreeable sensation; it is based on the internal adjustment of the opposites high and low; and it presents that complex example of fitting together manifested in the harmonia, or musical system of the octave. The consonance of the octave itself was also known as harmonia, as we can see in the musical discussion of harmony by Philolaus; it was a harmony not only of two tones which are at once opposed and similar, but also of two consonances—the fourth and fifth—which are different rather than opposite, but which even more graphically "fit together" to make an octave. It is the peculiarity of the conception of harmony to unite this specifically musical character with the apparently contradictory feature of abstract generality, and the puzzle is compounded by the fact that a simultaneous relationship was attached to a temporal art. When "harmony" came to designate the chordal aspect of music, there occurred something like a historical solution of a paradox. In any event, music reveals the complex mathematical order of the tonal system precisely in its connection with and dependence upon the more elementary duality of high and low, as well as providing this duality itself with a rational basis in the proportions of consonance. At the same time, it is related more intimately and pervasively with the physical and visual world through the tensions of stringed instruments and the dimensions of musical instruments of all types. Finally, in its temporal character it is able to bring the whole class of cyclic events under the head of harmony, which as a notion of fitting together might otherwise have remained limited for the most part to simultaneous phenomena. It is obvious that music was strategically situated to lend elaboration and structure to the concept of harmony in a way that proved ineradicable. Indeed the term "music" becomes at times more or less synonymous with "harmony," and takes on the same breadth of meaning. But this inherent suitability of music to its task had to await discovery and use by a culture that found it to be a natural expression of its outlook.

Etymology emphasizes the generality of the field of conceptions to which harmony belongs.<sup>2</sup> Ar or har enters a great variety of verbs in the

<sup>2</sup> See P. Bonaventura Meyer, Armonia; Bedeutungsgeschichte des Wortes von Homer bis Aristoteles (Zurich, 1932). The "Wortindex" of Diels and Kranz, op. cit.,

<sup>&</sup>lt;sup>1</sup> Frg. 6. The passage in question can be found in Hermann Diels and Walther Kranz, *Die Fragmente der Vorsokratiker* (5th ed., Berlin, 1934-37), Vol. I, p. 409 (later editions through the 8th [Berlin, 1956-59], are essentially reprints with few changes and additions, and will be found to correspond). There are brief but valuable discussions of the controversy over the authenticity of the Philolaic fragments in John Burnet, *Early Greek Philosophy* (4th ed., London, 1930), pp. 279-284, and in G. S. Kirk and J. E. Raven, *The Presocratic Philosophers* (Cambridge, 1957), pp. 308-313. Burnet regards the fragments as suspicious; Kirk and Raven conclude, more definitely, that they are a skillful forgery based on Aristotle.

Indo-European languages, signifying the unification of disparate or conflicting elements into an ordered whole. Verbs in early Greek literature beginning with this etymon have a broad range of application, and encompass not only the performance of music and the tuning of an instrument, but a physical binding together and a mental pacification, a transitive fitting together and an intransitive adaptation. Greek gives full representation to the physical and logical spheres of the Indo-European prefix, but neglects the temporal one completely for centuries. Homer uses ararisko "connect," aresko "adapt, reconcile, satisfy," arasso "slam together, strike, play the lyre," and harmozo "fit together." The last verb has a purely physical meaning in Homer, with a much more restricted application than the noun harmonia, but in later times it exceeded the noun in the versatility and breadth of its use, encompassing the diversity of "marry, arrange, administer, tune, kiss" which is revealed in Pindar, Herodotus, Plato, Aristophanes, and Euripides. Harmonia developed its variety of meaning earlier, and already designates in Homer not only a physical "connecting link" but a mental and qualitative "agreement."

Duality is a universal motif of myth; in Greece, the duality issues in harmony, which is revealed as the outcome of opposed but reconciled forces. The Boeotian myth makes Harmonia the daughter of Ares, the God of War, and Aphrodite, the Goddess of love and beauty, while the Attic version develops the musical element: Harmonia is not only the daughter of Zeus and the Atlantide Elektra, but she is also the mother of the Muses.

Paired opposites remain as fundamental to scientific cosmogony as they are to theogony and myth; thus a path is provided along which harmony enters into philosophic thought. But the importance of the cosmological role of harmony is guaranteed by additional factors that lend themselves readily to harmonic treatment: the motions of the heavens, the cycle of the seasons, and the idea of primary physical materials or elements. If we examine them closely, however, we find that these factors are all related. At first the elements are thought of not so much as general constituents, but as large masses that have particular locations in the world, and that may come into existence successively, like the divinities in a theogony. Earth is typically surrounded by concentric spheres of water, air, and fire, for example, or one of the elements will be treated as the source of the others. Thus the relationship between the spheres can become a basis for the relationship between the elements, while on the other hand the elements themselves can be reduced to more fundamental qualitative opposites, such as hot and cold, and wet and dry. Again, these are not only general forces, but can succeed one another in a seasonal cycle. Often qualities are not distinguished from ele-

contains a useful, compact guide to the occurrence of the word in Presocratic philosophy (Vol. III, p. 72).

ments; the quality "hot," for example, will be identical with the object "fire," rather than one of its components. Traces of such an origin are preserved in the tendency of elements—even in the classical system of Empedocles—to fall into pairs of contraries. The most conspicuous natural foundations of this whole pattern of thought—and the closest to myth—are the polarities of heaven and earth, male and female, and day and night. And at the other extreme stand the ultimate philosophic versions of duality: the abstract opposites sameness and otherness, or limited and unlimited, which are capable of serving in the generation of number or of the soul.

The history of harmony, however, is by no means coincident with the history of elements and opposites, or even with the history of the basic concept of cosmos. Only in particular schools of thought are cosmogonic processes and cosmic structures regarded as specifically harmonic, although in other cases we are often confronted with descriptions that are in fact if not in name essentially those of harmony. In the course of time, words such as *isonomia* are replaced by *harmonia*, while other concepts, such as those of mixture and measure and proportion, become charged with a musical significance. In order to explain the expansion and success of the concept of harmony we must identify the way in which it differs from other notions of order. Its distinctive feature is its aesthetic connotation, in particular its rich musical values, and their emotional and structural appropriateness to their task.

Early Ionian cosmology is too imperfectly preserved for us to determine the precise nature of its theories.<sup>8</sup> That it was to some extent harmonic in conception, however, is suggested by its systematic and geometrical nature, and also by the fact that it was the central source of later Greek ideas. Anaximander, the most important of the natural philosophers of Ionia in the 6th century B.C., described the birth of paired contraries from the boundless apeiron. Cosmic process was legal rather than harmonic: a divine justice controlled coming to be and passing away, exacting retribution for the illegal excesses of cold and hot, and wet and dry. The sun, the moon, and the stars were three wheels filled with fire and spaced according to mathematical proportions, very much as in later systems of cosmic harmony.

In the latter part of the 6th century, as a result of the Persian conquest of the Greek cities of Asia Minor, Ionia gave way to Southern Italy as the main seat of philosophic thought, and various natively Ionian philosophers migrated to this new location, where, at Croton and in other Italian cities, the Pythagorean school was the first to achieve prominence.<sup>4</sup>

<sup>&</sup>lt;sup>3</sup> See the excellent study by Charles H. Kahn, Anaximander and the Origins of Greek Cosmology (New York, 1960).

<sup>&</sup>lt;sup>4</sup> The literature on early Pythagoreanism is vast; its extent corresponds to the importance of the subject but is inversely proportional to the amount of dependable information available. Reliance on Neopythagorean sources is dangerous, recourse

According to tradition from Herodotus to Iamblichus, Yythagoras of Samos acquired both his mystical and mathematical wisdom from Babylonian and Egyptian sources, during an extended period of foreign travel, and there can be little doubt that the foundations of both his religious code and his scientific theory must be sought in these ancient Mediterranean civilizations as well as in Orphism. But as difficult as it is to specify the older constituents of Pythagorean thought, it is still more difficult to determine the precise achievements of Pythagoras himself. We may safely say, however, that no one in Western musical philosophy has had an influence equally powerful. With the early Pythagoreans, active toward the end of the 6th century, the notion of harmony acquired its epochal connection with mathematics, and also its more specifically musical character. They imparted to Greek and to European thought a lasting prejudice that tied music to the cosmos, to rational order, and to ethical value as well, and these ties dominated the musical outlook of both Antiquity and the Middle Ages. Although philosophy was typically a way of life in ancient times, it was especially so for the Pythagoreans. The movement was primarily religious, social, and political, and perhaps the true greatness of its founder was that of providing inspiration and leadership. The brotherhood practiced a type of Orphic religion characterized by an elaborate doctrine and an associated rule of behavior; the code was severe, and involved taboos, discipline, and asceticism. A central doctrine was the immortality and transmigration of the soul, which could travel from human to animal; that abstinence from meat was enjoined may very well have been a consequence. The silence kept by the Pythagoreans may have been disciplinary rather than secretive, but whatever the reason, much of their belief and practice remained unknown to outsiders. Certainly their chief concern was with purification, but this is no more than a corollary of their conception of the soul.

Joined to this basic religious outlook and not merely existing side by side with it was a profound interest in mathematics and in a metaphysics founded on mathematics. The significant association of religion and mathematical speculation created a fostering climate for a powerful and purely theoretic interest in science, which in its religious motivation and

to Plato's Timaeus less so. Aristotle is concerned with the later Pythagorean mathematicians rather than with the original sect. Works of particular value are Armand Delatte's Études sur le littérature pythagoricienne (Paris, 1915), and B. L. van der Waerden's "Die Harmonielehre der Pythagoreer," Hermes LXXVIII (1943). Representative accounts of Pythagoras and his school are those in Burnet, op. cit., Ch. II, and in Thomas Little Heath, A History of Greek Mathematics (Oxford, 1921), Vol. I, Chapters III and V. The political history of the early Pythagoreans has been reconstructed, largely on the basis of Aristoxenus, Dicaearchus, and Timaeus of Tauromenium, by Kurt von Fritz, in his Pythagorean Politics in Southern Italy (New York, 1940). On ancient mathematics in general and the question of the originality of the Pythagoreans see Otto Neugebauer, The Exact Sciences in Antiquity (2nd ed., Providence, R. I., 1957).

freedom from practical concerns could easily stray into numerology and magic. The theory of numbers and geometry were developed in close association; the proportional theory of vibrating strings was a central scientific discovery; and the Pythagorean cosmogony and cosmology were almost certainly based on a variety of harmonic relationships. That numbers are in some fashion constituents of reality is the fundamental metaphysical notion of the Pythagoreans. Unfortunately it is impossible to determine the precise form of this belief; whether all things were held to be numbers literally or simply to be numerical in their form and properties we do not know, but in either case the conception remains important and fruitful. It can be understood only by keeping in mind the fact that number was represented in concrete physical form: geometrically, by arrays of ciphers, and notably by the arrangement of pebbles. Thus number was not abstracted from physical reality as it is in more modern thought. The conception obviously contained two inherent difficulties: zero could not exist, and incommensurable physical and geometrical magnitudes had a peculiar "irrational" status. Prime numbers were arranged in rows, and those with two and three factors in various plane and solid figures according to their properties. Another restriction here was the impossibility of exceeding three dimensions. The most important of the Pythagorean numbers was the tetractys of the decad, a quaternary consisting of the first four integers. This was sacred; it yielded the perfect number 10, and thus provided the underlying reason for the decimal basis of counting. It had a musical implication in that all sets of four were regarded as somehow harmonious and controlled in the relationship of their elements, and more specifically in that it furnished the ratios for the basic consonances of octave, double-octave, twelfth, fifth, and fourth (2:1, 4:1, 3:1, 3:2, and 4:3). Also of great importance musically was the theory of means and proportion. The early Pythagoreans knew that the musical consonances involved the subcontrary as well as the arithmetic and geometric relationships, and the subcontrary mean was named "harmonic," possibly by Hippasus. Specifically, string lengths arranged in the pattern 12,9,8,6 gave the intervals of fourth, fifth, and octave, so that the consonances which were the framework of the scale could be derived from the arithmetic and harmonic means between two quantities in the ratio of 2 to 1.

The early Pythagoreans doubtless found consonant relationships in the macroscopic structure of the world also, and they may have thought of cosmic harmony as in some sense actually sounding, although it is possible that they would not have seen any importance or even any meaning in such a question. The suggestiveness of acoustic phenomena was undoubtedly very great; like rows of pebbles, strings present numbers as lengths, and they make their properties audible as well as visible and tangible. Most important, however, is the easily discovered fact that con-

sonances, and therefore numerical properties, do not reside only in relationships of length. Strings differing in tension or in physical qualities contain harmony in a much more mysterious way, and tend to suggest that number is of the essence of reality even when it is imperceptible.

The diverse factors of the Pythagorean outlook seem originally to have been part of a unified picture provided by an important cosmogonic theory, which can be reconstructed hypothetically in outline from later reports.<sup>5</sup> The fundamental principles were the paired contraries, the Limited and the Unlimited. From these number was generated, I representing their initial combination and containing in itself, as a result, both the Odd and the Even. A second similar process gave rise to 2, and successive repetitions to 3 and 4. This constituted the tetractys of the decad; after 10 the series simply repeated itself. Numbers gave rise to geometric figures: a second unit placed alongside the first generated a line from a point, a third unit placed so as to form a triangle produced the basic twodimensional figure, and a fourth unit placed on top of these made a tetrahedron, the first three-dimensional figure. Thus geometry too was derived from the tetractys. And from geometry the physical world was generated, for the tetrahedron, the basic solid form, became the physical element fire, which was situated in the center of the world and drew upon the Unlimited surrounding it to complete the cosmogonical process. The crucial point, the relationship between the mathematical and physical entities, we are unable to determine; we do not know whether mathematics was conceived as giving the form of the physical world, in which case there would be a true problem of genesis, or whether the two were identified, so that the tetrahedron and fire were one and the same. And this ambiguity arises again in the relationship of arithmetic and geometry; as we have indicated, a genesis of figures from pebble-like material constituents is certainly unable to account for incommensurable lengths. The closest view we can secure is given by the cosmogony of Plato's Timaeus, a monument to the human imagination that is undoubtedly an elaboration of the Pythagorean tradition and that strongly emphasizes the harmonic nature of the cosmos, although it does not entirely remove the enigma surrounding the issues we have mentioned.

A conception of harmony very different from those of the early Pythagoreans, but equally profound, was advanced by Heraclitus of Ephesus,<sup>6</sup> active around 500 B.C. Heraclitus finds certainty in self-knowl-

<sup>&</sup>lt;sup>5</sup> The evidence is marshalled by Francis M. Cornford in *Plato and Parmenides* (New York, 1957), Ch. I.

<sup>&</sup>lt;sup>6</sup> There are recent detailed studies of Heraclitus by G. S. Kirk: Heraclitus; The Cosmic Fragments (Cambridge, 1954), and by Philip Wheelwright: Heraclitus (Princeton, N. J., 1959). The fragments can also be found in Burnet, op. cit., Ch. III, in Diels and Krantz, op. cit., Vol. I, Ch. XXII, and in Kirk and Raven, op. cit., Ch. VI; so many of them come into question here that there is little point in singling any out for mention.

edge rather than in the examination of nature and the amassing of learning. His combination of reason with the empiricism of the Ionians appears to anticipate Plato; but Heraclitus does not believe in changeless ideal entities behind perceptible phenomena; the interrelation is more intimate, and indeed his dynamic conception of harmony was easily misunderstood. The critique offered by Eryximachus in Plato's Symposium 7 conspicuously fails to do it justice, Plato depicting the physician as hopelessly misled by Heraclitean paradox. Love and harmony both present the same problem: are their constituents opposite, or similar? or are they necessarily related in any way even before their harmonization? In other dialogues of Plato also, considerable complication arises over the relationship of opposites; those of the phenomenal world flow into one another and only in the world of forms are opposites irrevocably distinct. But this kind of machinery is not necessary to Heraclitus, for his picture of the world is only superficially similar to Plato's, and is not actually dualistic at all. The world is one of ceaseless change, but it contains a harmony that controls both spatial and temporal phenomena. Enmeshed in the process of the world, hidden somehow in the very midst of the change and transience typified in fire, is a divine Logos, a measure and proportion. The river is constant change, but it is permanence as well; it is always the same river, and by measure, the arrival of water is balanced with its passage at any point. This element of regulation and order in the world is not found simply in external nature nor is it simply subjective; indeed this distinction has no importance, and the order is as omnipresent as the change: it is at once cosmic and ethical. Harmony is perhaps a more adequate description of its nature than either measure or logos, for harmony shows the inevitable relation to opposites, the holding in balance of forces at odds with one another; in a word, the central connection of permanence with transience. We can come to know the divine order of harmony more readily in ourselves than in the external world, and it is the knowledge of this universal but secret logos that gives Heraclitus his superior and cryptic manner and his scorn for the rest of mankind, philosophers included. On the other hand, the very nature of his conception of harmony accounts for the paradox and enigma in the writings of "the dark one." This hidden harmony is more important than any known by the senses, for without it the world would fall to pieces. Yet conflict and opposition are also essential everywhere; they can be called not prerequisites but co-requisites. But things at variance really agree; unity is bestowed by harmony, or if we wish, harmony is really unity. Significantly, it is a musical instrument, the lyre, that Heraclitus uses, along with the bow, to exemplify his conception. In both, opposed forces are connected with one another and adjusted, while from a dynamic point of view, when the strings are drawn back, the restoration of harmony produces music in the one case and

<sup>&</sup>lt;sup>7</sup> Symposium 187a-187b.

marksmanship in the other—parallel and really equivalent manifestations, for both overcome distance, whether with sound or arrow, to reach their target, both are outcomes of action that is at the same time harmonious and accurately directed, and both are symbols of a life correctly lived so as to achieve its goal. Even literally, whether in instrument or in weapon, music and accuracy are present together, for the bow is not silent in action, and like the flight of sound, the arrow is audible in travel. The depth of the concept reaches back to the identification of musical bow and hunting bow in prehistory. In addition, although its work is death, the bow  $(bi\delta s)$  is life  $(bi\delta s)$ ; and in this Heraclitus continues the primitive tendency to find metaphysical significance in sonorous resemblance. Temporal events too, reveal the same principles; night is succeeded by day, winter by summer, and every aspect of the world has its opposite, even where we do not perceive it. A comprehensive concept of harmony is consequently a central feature of Heraclitus's philosophy.

The Eleatic school, which developed in the first half of the fifth century and is represented mainly by Parmenides, had its basis in reason rather than sensory experience or number, and produced a strict ontology grounded on logic. While the indivisibility and immutability that it deduced as the properties of Being left no room for harmony, Parmenides recognized in addition to a changeless reality, a world of sense and seeming, for which the question of cosmogony again became meaningful. Here were to be found sensible contraries, such as light and darkness, and hot and cold, along with a guiding goddess of harmony who ruled over the union of male and female, and who devised a theogony starting with the creation of Eros. But Parmenides took an extreme stand with respect to the relation of truth and appearance; he saw no point of contact between them, and both this separation and his emphasis on the superior reality of Being were obviously of great importance in the constitution of Plato's metaphysics.

The Sicilian philosopher Empedocles, who flourished about 450 B.C. and who resembles Pythagoras in combining science with a cult of purification, established the canonical system of four elements, or "roots" (rhizomata): earth, water, air, fire; and of two cosmic forces that act on them: love and strife. Everything in the world is a mixture of the elements harmonized by Aphrodite. When constituents are most similar, harmony and love are strongest, and this is particularly the case in the connection of Earth, Sea, Heaven, and Sun with their own parts. Generation and destruction also, after Parmenides, could be conceived only as mixture and separation, but they are controlled by the dominance of love

<sup>&</sup>lt;sup>8</sup> See Cornford, op. cit., Burnet, op. cit., Ch. IV, Diels and Krantz, op. cit., Vol. I, Ch. XXVIII, and Kirk and Raven, op. cit., Ch. X.

<sup>&</sup>lt;sup>9</sup> Burnet, op. cit., Ch. V, Diels and Krantz, op. cit., Vol. I, Ch. XXXI, Kirk and Raven, op. cit., Ch. XIV. See especially frg. 6, 8, 9, 11, 12, 17, 20, 22, 23, 35, 36, 71, 98, 107.

and hate respectively. Empedocles's cosmogony, in which elements and forces are still identified with divinity, is thus conceived as a harmonic process, and the distinguishing feature of his conception of harmony is its dependence on the similarity of the harmonized constituents. This is a characteristic that undoubtedly is due to his emphasis on the role of love. There is also an alternation of love and hate; in turn the elements unite to form a unity and separate to form a multiplicity; but this oscillation does not seem to have been thought of as a temporal version of harmony.

The later Ionian philosopher Anaxagoras of Clazomenae, 10 whose writings come somewhat after those of Empedocles and who is important in having made Athens the center of his philosophic activity, was the originator of the important concept of Nous, or mind, as an ordering force in the world. As Anaxagoras conceived it, however, Nous was not immaterial, but rather a distinctively tenuous and pure kind of matter. Both in its nature and its function, it was thus a logical successor of the Heraclitean Logos, the divine fire. Like the love and strife of Empedocles, Nous in effect produced an analysis of the hylozoistic idea of primitive material, extracting the causal components of force and motion and life, and leaving an inert matter conceived in the form of basic qualitative elements, or "seeds" (spermata). Sensible things and even the elements of Empedocles became harmonic mixtures of these seeds produced by the action of Nous and then by a resultant series of mechanical events. One type of seed predominates in each mixture and is responsible for the quality of the whole.

Towards 400 B.C., about a century after the time of Pythagoras, we come upon the first of the later Pythagoreans whose ideas have been preserved in some detail. Nicomachus tells us<sup>11</sup> that Philolaus demonstrated harmonic proportion by making use of the cube, which has twelve edges, eight vertices, and six faces. And the Philolaic fragments<sup>12</sup> testify to an interest in harmony that is both ramified and deep. Philolaus called the octave *harmonia*, described it as containing the fifth and the fourth, and gave the ratios of all three intervals; he also defined the tone as the difference between fifth and fourth, so that its ratio becomes 9:8, and considered the system of the octave as filled in with such tones—of which the fourth contains two and the fifth three—plus the two remaining semitonal intervals. This gives the basic theoretical pattern underlying the scales and modes of Greek music; if it is expressed in tone just as it stands, the result is a Dorian scale of the diatonic genus. In addition, Philolaus deals with the metaphysical nature of harmony, making use of

<sup>&</sup>lt;sup>10</sup> Burnet, op. cit., Ch. VI, Diels and Krantz, op. cit., Vol. II, Ch. LXIX, Kirk and Raven, op. cit., Ch. XV. See especially frg. 12 and 17.

<sup>11</sup> Introduction to Arithmetic II. 26.

<sup>&</sup>lt;sup>12</sup> Diels and Krantz, op. cit., Vol. I, Ch. XLIV; see note 1, above. There is a good account of the Philolaic cosmology in J. L. E. Dreyer, A History of Astronomy from Thales to Kepler (2nd ed., New York, 1953), Ch. II.

the concept that the world and everything in it are made up of two kinds of elements, the limiting and the boundless. These two fundamental elements or principles are structurally insufficient, however, for they are unequal and unrelated; harmony is also required. Here we learn the vitally important fact that the Pythagorean contraries were combined by a harmonic process. If harmony has an ontologic function, number has an epistemological one, for it belongs to everything that can be known; its very nature is such as to give knowledge. Without number, things would not be clear either in themselves or in relation to one another; but number brings them into agreement with perception and makes them cognizable and capable of interrelationship. Like knowledge, truth is inherent in number and specific to it, while falsehood is hostile to number and irreconcilable with it, belonging instead to the nature of the boundless, the senseless, and the unreasonable. Philolaus stresses the universality of number: it plays a role everywhere—not only in divine things, but in all human works and words, including music. An interesting feature of the discussion is that harmony appears both as a result of number and as its foundation.

Although he may not have devised it himself, Philolaus transmitted what was widely accepted as the standard Pythagorean cosmology, but unfortunately we have no information about the mathematical details of its structure. An important feature of the system is that the earth is not placed at the center of the universe; this position is occupied by a central fire which is surrounded by ten wheels bearing successively a counterearth, the earth, the sun, the moon, the five planets, and the fixed stars. Aristotle believed that the counter-earth had been introduced solely to bring the number of wheels to ten;13 that is, as a manifestation of the holy tetractys, but it could just as well have been invented to account for eclipses. On the other hand, the number 10 has been taken to exclude the possibility that harmonic notions are part of the Philolaic cosmology, since there were only seven tones in the Greek scale. The earliest Greek systems of planetary harmony that have come down to us, however, reveal a concern with consonances rather than with the scale, and the number of wheels is determined by other factors. This by no means proves that Aristotle was right in his explanation of the ten wheels, but he certainly might have been, and in any event, it is difficult to believe that Pythagorean astronomy could have been unrelated to harmony. The musical cosmology of Plato's Timaeus, which is expounded in the dialogue by a Pythagorean, is almost proof of the point, although we really do not have sufficient evidence to establish the matter either way.

Of Eurytus,14 who was active in southern Italy around 400 B.C., we

<sup>&</sup>lt;sup>13</sup> Metaphysics I. 5 (985b. 23-986a. 13).

<sup>&</sup>lt;sup>14</sup> See Burnet, op. cit., pp. 99-100; Diels and Drantz, op. cit., Vol. I, Ch. XLV, and Kirk and Raven, op. cit., pp. 313-317.

have only Aristotle's report that he decided what was the number of what—of man or of horse—by imitating the figures of living things with pebbles, as some people bring numbers into the forms of triangle and square. But about Archytas of Tarentum, a pupil of Philolaus and a friend of Plato, we are again considerably better informed.<sup>15</sup> He concerned himself with the traditional group of Pythagorean studies that later became the quadrivium, discussing the kinship of geometry, arithmetic, astronomy, and music, which he mentions in this order; he admires the work of mathematicians in these disciplines, and especially in music. The studies are mathemata; they are all related because they deal with the two primary forms of Being, by which he presumably means multitude and extension. Music, here identified with harmonics, is thus explicitly recognized as one of the mathematical sciences. That Archytas wrote on all of these sciences himself is more than likely; what we know of his work points in this direction, and the disciplines were so intimately associated in the Pythagorean outlook that they probably were always studied together. Indeed Vitruvius mentions Philolaus and Archytas of Tarentum among the men "on whom nature has bestowed so much skill, acumen, retentiveness that they can be thoroughly familiar with geometry, astronomy, music, and other studies."16 In his analysis of the physical nature of sound, Archytas comes close to the true state of affairs, correctly connecting higher pitch with speed and power, but he falls into errors of detail by failing to take vibration or wave length into account. Ptolemy regards him as the most important of the Pythagorean writers, and both Ptolemy and Boethius discuss his calculation of the intervals of the musical genera, a detailed interest in tuning he might easily have taken over from his teacher Philolaus. Boethius has also preserved his proof that no geometric mean exists between two numbers in superparticular ratio, 17 that is, between two successive integers, a theorem that appears to be his outstanding contribution to musical theory, and has its specific application in demonstrating that the whole tone cannot be rationally divided into two equal intervals. The proof is also found considerably later than Archytas in Euclid's Division of the Monochord (c. 300 B.C.). 18 It has an additional interest in revealing something of the interconnection of the mathematical sciences, for it rests on various arithmetical propositions which can be found in Euclid's Elements (Book VII); thus at

<sup>&</sup>lt;sup>15</sup> See Diels and Krantz, op. cit., Vol. I, Ch. XLVII, and Heath, op. cit., Vol. I, pp. 11, 14, 85-86, 90, 212-216, 246-249.

<sup>16</sup> De architectura I. i. 16.

<sup>&</sup>lt;sup>17</sup> De musica III. 11.

<sup>&</sup>lt;sup>18</sup> Theorem III. See Vol. VIII of the *Opera omnia*, ed. by I. L. Heiberg and H. Menge (Leipzig, 1916), pp. 162-163. There is an English translation, "Section of the Canon," in Charles Davy's *Letters upon Subjects of Literature* (Bury St. Edmunds, 1787), Vol. II, pp. 264-304.

the same time we learn that the discipline of arithmetic was known to Archytas in something like the form in which we find it in Euclid. Another problem that Archytas solved brilliantly by a three-dimensional construction is that of duplicating the cube, or of finding two mean proportionals between two straight lines; this theorem similarly shows the interrelation of the mathemata, for it enters into the harmonic cosmogony of Plato's Timaeus. More specifically musical is Archytas's discussion of the arithmetic, geometric, and harmonic means; he defines the three, and considers all to belong to the subject of music, which doubtless signifies that he conceives of this as the general study of relative number; although it is true that the means are all used in the relationships of actual music, so that the mathematical discipline is not so distant from the specific theory of the art. Finally Iamblichus reports that both Philolaus and Archytas were familiar with the "musical" proportion 12, 9, 8, 6, which the Neopythagoreans regarded as the most perfect of all.

There can be no doubt that the scientific conception of harmony and music was well established by the time of Plato. In the *Theaetetus*<sup>19</sup> we learn that this mathematician and his teacher studied the traditional mathemata, and essentially the same group of sciences is discussed in the *Republic* (Book VII), the *Laws* (Book VII), and the *Epinomis*. It might seem that the Sophists would oppose such studies on principle or at least not find them useful except possibly for purposes of refutation, but even they taught and studied them (although Protagoras was an exception), as we can see in *Protagoras* and in *Lesser Hippias*.<sup>20</sup> More specifically, we are told that under their tutelage pupils reviewed these disciplines, or learned them for a second time; mathematics must have been to some extent a general feature of private education, and it was taught in public schools as well, although from a more practical point of view.<sup>21</sup>

Plato's interest in the discipline of harmonics is grounded partly in his conviction that harmony and music have a close relation to the cosmos. One of the ironic etymologies of the *Cratylus* specifically couples music with the harmony of nature.<sup>22</sup> In support of the thesis that the name Apollo means "moving together," Socrates points to the fact that Apollo is the god of harmony; musicians and astronomers both declare that he makes all things move together by a harmonious power, whether in the harmony or concord of song or in the poles of heaven. The discussion links music, prophecy, medicine, and archery, as the four attributes of Apollo, and also points to harmony as the unifying factor, since Apollo is the god of harmony. This suggests not only the Heraclitean coupling of lyre and bow, but also the connection of harmony with wisdom (in

<sup>19</sup> Theaetetus 145a-145d.

<sup>20</sup> Protagoras 318d-318e; Lesser Hippias 363b-368d.

<sup>&</sup>lt;sup>21</sup> See Heath, op. cit., Vol. I, pp. 18-22. <sup>22</sup> Cratylus 404e-406a.

the attribute of prophecy) and the concept of medicine as the art of bringing about harmony in body and soul.

The impressively broad scope of the conception of harmony is revealed in the important discourse of the physician Eryximachus in the Symposium.<sup>23</sup> The speech is compounded essentially of Hippocratic and Empedoclean theories of the harmony in man and in nature, including the harmony of the seasons, and of wet and dry, and hot and cold. It also contains the criticism of Heraclitus that we have mentioned above, and maintains that harmony is the reconciliation not of opposite elements, but of elements that disagreed once and are now harmonized. Presumably then, harmony is possible only if some alteration in the elements takes place upon harmonization so that they come to possess something in common. If two strings are harmonized, for example, assuming for simplicity that they may differ only in length, we adjust the relationship of the two lengths so that there is a unit by which both strings can be measured. The argument is clearly in line with Empedocles's emphasis on similarity as a prerequisite of harmony. And the fundamental theme of the discourse, the association of harmony and love, also derives from the same philosopher.

Of the most striking expression of the musical constitution of the world, the harmonious properties of the heavens, we really have no clear evidence until Plato's Republic and Timaeus. Sensory and synesthetic elements are a distinctive feature of the myth of Er in Republic Book X;24 the vision of the rotating wheels of the world is a post-mortem experience of a warrior killed in battle. The music actually sounds, and the tones are connected with visual impressions, particularly with colors. Appropriately, the Sirens and not the Muses preside over the cosmic music. The intrusion into a cosmological picture of perceptible rather than purely intelligible factors can be explained without great difficulty. It is due doubtless to the fact that to the soul freed from the body, rational apprehension takes on the character of immediate perception. Also the myth of Er is not a straightforward cosmology, but a pedagogical device teaching the ultimate rewards of justice; it is poetry in a more immediate sense than the philosophical dialogue itself, and thus capable of serving a more elementary educational purpose. Accordingly it uses the method of sensory appeal; it is imitative art, but a true imitation.

There are eight wheels in the vision; their appearance is described in respect of the width of their rims, their color, and their speed, but each of the three lists mentions the wheels in a succession that reflects the

<sup>&</sup>lt;sup>23</sup> Symposium 186a-188e.

<sup>&</sup>lt;sup>24</sup> Republic 614b-621e. See the discussion of this passage in James Adam's edition (Cambridge, 1902), and in the Introduction (by A. Diès) of the Budé edition (Paris, 1947). Pierre Boyancé has also dealt instructively with the myth in Le culte des Muses chez les philosophes grecs (Paris, 1937), and in "Les Muses et l'harmonie des sphères," Mélanges dédiés à la mémoire de F. Grat (Paris, 1946).

balanced order underlying them. On each wheel sits a siren singing one tone, and the eight together form one harmony. In view of the clearly simultaneous nature of the "harmony," it is unlikely that Plato intends to designate a scale. Furthermore a scale is possible, although still unlikely, only if the tones were connected with the widths of the rims of the wheels, or with hypothetical orbital speeds. The angular speeds of the wheels were more or less accurately known, and palpably did not yield a scale. (In addition, since three of the angular speeds are given as identical, there could be only six different pitches; a complete scale, at any rate, would be impossible.) On the other hand, the radii of the wheels, which are doubtless what the tones represent, were simply not thought of as scalar in their relationship (this can be determined from the account in the Timaeus). To complete the picture of simultaneous harmony, the three fates join in the singing. They sing of the past, present, and future respectively, so that the music itself includes temporal events in a highly explicit form. There is a relation between this depiction of time and the time embodied in the rotation of the wheels, for the Fates touch the various wheels at certain intervals and influence their motion: Clotho, who sings of the present, helping with her right hand the revolution of the outer wheel; Atropos, who sings of the future, guiding with her left hand the inner wheels, which all revolve slowly but at various speeds in the opposite direction; and Lachesis, who sings of the past, touching first the one and then the other, with each hand in turn. Plato has here provided an ingenious device to "save the appearances" of the complex motions of the stars, and in addition, he makes time subservient to divine control, so that its structure, as revealed in the heavens, becomes significant for human destiny. The Fates represent the connection between human temporal existence and the cosmos, so that the choice of a type of life by each soul, which is described next in the myth, becomes a decision set in the context of cosmic justice. Quite apart from questions of scientific cosmology, the whole vision is intended to depict justice on a cosmic plane; it is not so much an allegory of justice, but a characteristic union of the cosmological and legal notions in the tradition of Anaximander. Thus each Siren keeps to her own tone, a counterpart in the universe of justice in the state, which consists in each citizen doing his own business. And this in turn is a parallel of justice within the individual. Appropriately reflecting the concept of justice, the array of relationships in the cosmos is characterized by balance, and this takes on sensible beauty and order for the soul that achieves a vantage point giving direct insight. Injustice is then seen to be only apparent—a momentary deviation that does not disturb the whole.

The cosmology of the *Timaeus* has a considerably more detailed musical character, and also encompasses the problem of genesis.<sup>25</sup> The cosmos,

<sup>&</sup>lt;sup>25</sup> Since numberless philosophical, theological, and mathematical works are com-

as a perfect whole of perfect parts, is constructed throughout by a method based on a conception of harmony: intermediates—geometric, arithmetic, and harmonic means—connect its various parts and the opposites it contains. The world is a living organism with a soul as well as a body. Both of these are created by a divine Artificer who is producing in effect a master work of art, a huge spatial and temporal music. Pythagorean and Ionian traditions are combined in a masterful synthesis that encompasses the mathematical harmonies of the soul and the physical harmonies of the body. The question of the status of number and the Ideas is answered by compounding the soul of their likeness in the form of an impalpable material and its articulations and motions. The soul transcends the body but is intimately connected with it. The Ideas themselves remain without the attribute of location, but the soul explains how they can be relevant to the sensible world and how they can become objects of knowledge. Every constituent of a complete metaphysics is incorporated in a single narrative. Mathematics is divided: number finds its place in the soul and so does the geometry of circles and spheres and rotation; but the rest of geometry-straight lines and all the angular figures-belongs to the physical world as its ultimate basis.

The Artificer first creates the soul of the world, mixing together materials that are related to the general classes of existence as we find them discussed in the later dialogues. The psychogony represents a transformation of Pythagorean cosmogonical ideas which Plato effected through his critique of Parmenides. Existence, Sameness, and Otherness

mentaries on the Timaeus in fact but not in name, the total volume of writing based on this dialogue is incredibly large. While older commentaries have become historical documents that express the musical thought of their time, more recent commentaries are of less interest in this respect, and serve instead as the immediate background of our own analysis. Thus we may logically mention here the most useful scholarly commentaries of the 19th and 20th centuries: August Boeckh, "Über die Bildung der Weltseele im 'Timäos' des Platon," Gesammelte kleine Schriften (Leipzig, 1858-74), Vol. III (first published shortly after the beginning of the century); T. Henri Martin, Études sur le Timée de Platon (2 Vols., Paris, 1841); Paul Shorey, "The Interpretation of the Timaeus. I," and "The Timaeus of Plato. II," American Journal of Philology IX-X (1888-89); Albert Rivaud, "Notice," in his Timée (Paris, 1925: Vol. X of the Budé edition of Plato), and "Études Platoniciennes," Revue d'histoire de la philosophie II-III (1928-29); Alfred M. Comford Plato's Commentary on Plato's Timaeus (Oxford, 1928); and Francis M. Cornford, Plato's Cosmology (New York, 1937). The musical details of the structure of the soul were restudied recently by Jacques Handschin in "The 'Timaeus' Scale," Musica disciplina IV (1950). The most debated passages of the Timaeus have been precisely those that deal with harmony, and in particular with the creation of the soul; but while some of the details are problematical, they are also unimportant, and do not affect the general significance of Plato's discussion. More serious is the question of the nature of his concepts, of the correct balance of literal and figurative meaning in the notions of the Artificer, the materials of the soul, creation in time, and so forth. Each age and each exegete has given different relative weight to the components of poetry and philosophy. It is my feeling that this peculiarly Platonic compound has its own unique eloquence and import, and I have tried to leave it undisturbed so that it might speak for itself.

are blended in a process that involves various notions of a harmonic nature. Existence itself, for example, is compounded out of two constituents -Indivisible Existence and Divisible Existence—which are contraries, and it is thus intermediate between them. In addition, Existence then mediates the combination of Sameness and Otherness. But the harmonic aspect of the world soul is not limited to the constitution of its material, for after this is blended, it is divided into parts that have the relationships of the tones of a vast Dorian musical scale of the diatonic genus. The range is nearly five octaves—much greater than that of practical Greek music. To derive the scale, Plato makes use of two numerical sets—1, 2, 4, 8 and 1, 3, 9, 27—which employ the first three powers of 2 and 3 respectively and have 1 as a common term; the seven integers are arranged in ascending order to form a scalar framework. The two constituent sets represent opposites again, this time of odd and even number-a duality that is another version of the contraries Sameness and Otherness. There are three powers because the soul is tridimensional. Two portions of the material are then placed in each successive interval of the framework, the size of these portions being equal in each case to the arithmetic and harmonic means between the two terms defining the interval. Finally all the resultant musical intervals of a fourth are filled up with whole tones in the ratio 9:8, leaving over in each fourth the diesis 256:243. This scalar series of magnitudes, which we can take as connected one to the other, is then split lengthwise and formed into two strips, which are bent into circles and arranged like a representation of the celestial equator and the ecliptic. These are set into rotation, the outer motion being called the motion of the same and the inner motion that of the other. Rotation is the geometric counterpart of a recurrent algebraic operation, in this case of the successive doublings and triplings in the original numerical framework, and the octave-experience in particular calls for a circular representation. At the same time, of course, Plato is expressing the important theory that immortality is characterized by circular motion. The inner circle is divided into seven concentric parts, and these are in turn spaced according to the same double tetractys, so that the intervals between them are given by the series 1, 2, 3, 4, 8, 9, 27. They are then made to move at speeds which are various but which again are determined by proportional relationships. The soul of the world, as Plato tells us, partakes of reason and harmony.

Having made the soul, which is invisible, the creator constructs the sensible body of the cosmos. The visible planets and stars are placed in the circles of the other and the circle of the same respectively, and thus are arranged in the same mathematical-musical relationship as the soul itself. In the construction of the body the creator must deal with the realm of necessity, which fundamentally is the unformed extension in which the world is made. Impressed upon this extension but subservient

to its inherent tendencies are the elementary geometric patterns of which the primary materials, the so-called elements, consist. These elements are originally fire and earth, but it is necessary to bind them together, and for this purpose geometric proportion is employed. This provides the most perfect bond, for the geometric mean fuses completely with the extremes. Since the world is to be tridimensional, however, two means are required, and thus two additional elements, air and water, are placed between fire and earth in such a way that the four constitute a continuing geometric progression. Thus the body of the world "was harmonized by proportion." But the elements must actually have some common substratum, for-with the exception of earth-they can be transmuted one into another. They are made up not of qualitative contraries but of geometric atoms too small to be seen. Basically then, the sensible world consists not of gross matter but of mathematical structures imprinted upon space, a view which finds remarkable confirmation in 20th-century science. Four of the Platonic solids—tetrahedrons, octahedrons, icosahedrons, and cubes—are the seeds of fire, air, water, and earth respectively, and different species of the elements are caused by seeds of different sizes. The ultimate atoms are really two types of triangles, the isosceles right triangle and the scalene right triangle that is half of an equilateral triangle, for these make up the faces of the regular solids. They also provide an explanation of transmutation, since the second type of triangle is a constituent common to fire, air, and water. The constitution and properties of the elements also, then, are "perfected and harmonized in due proportion" by the creator.<sup>26</sup> Finally in addition to the fundamental proportional relationship between the elements as a whole, particular proportions characterize their combination to make up the various objects of the world, both animate and inanimate. Thus all the compounds of the elements—the whole sensible world of becoming—are comparable to the material of the world soul, which is a proportioned mixture of components; and in their overall arrangement too, soul and body follow the same musical principles of order.

The mathematical instrument used to combine materials is the geometric mean; accordingly geometric progression is common to soul and body. But also, the particular aspect of the soul that corresponds to the perceptible courses of the heavenly bodies is appropriately patterned on a combination of two continuing geometric progressions of opposed nature. On the other hand, the detailed structure peculiar to the soul involves all three types of mean. The harmonic mean may very well have been regarded as the most fully adequate representation of harmony, and thus, since harmony was typical of perfect structures, as specifically characteristic of the realm of purpose and the true knowledge of being. In any event, the mathematical construction of the soul comprises progres-

<sup>&</sup>lt;sup>26</sup> Timaeus 56c. The translations of Plato are by Jowett.

sions of every type, all welded together in the unity of the musical scale.

The importance of the number four as a basis of harmonic order is seen once more in the tetrachord, the fundamental unit of the musical system and thus of the soul. And it is found also in the peopling of the world with four types of creatures constituted—apart from the matter of soul—of combinations of the four elements. The first are the immortal gods, who are the planets and stars themselves, and the other three are the mortal air, sea, and land animals. This provides a tetractys not mathematically defined, but correlated with the elements, each of which is peculiarly appropriate to one species of creature: fire, air, water, and earth are the most important if not the sole constituents of the species of the heavens, air, water, and earth respectively.

As far as the general analysis of harmony is concerned, the importance of the Timaeus consists in making explicit a more advanced theory of the harmony of opposites, and then generalizing it so that it applies also to more than two components. In this theoretical respect, the dialogue is actually an elaborate harmonic study, but because it contains as well an essentially universal treatment of the metaphysical, ethical, and aesthetic implications of harmony, its scope is still more remarkable. As we have seen, the Symposium advances the idea—which the Philebus later takes up in more explicit terms—that opposites require modification before they can be harmonized; some principle applied to both must make them compatible. (Their actual attraction can then be explained by the force of love.) But in the Timaeus the idea of binding the contraries with some third entity is made basic. The bond is mathematically conceived as a mean, and it is of the same nature as the elements to be harmonized. Thus the concept of opposites that are compatible and held together by an attractive force is replaced by the more abstract and general concept of a number of elements standing in a determined relation to one another. But this notion of harmony gives rise to its own ethical qualities of love and goodness; it is also applicable to more complex structures, such as the internal constitution of living beings; and it produces aesthetic values as well.

The cosmogony of the *Timaeus* is in essence a story of the creation of harmonic order, a concept that now includes ordered arrangement of a great many kinds; "when all things were in disorder, the Demiurge created in each thing in relation to itself, and in all things in relation to each other, all the measures and harmonies which they could possibly receive." <sup>27</sup> But in addition, it becomes obvious that the harmonic view of the world is not purely an objective picture of structure. Value is apparently an inevitable feature of cosmology, as it is of myth and to some extent of natural science as well. Divine embodiments of natural forces are the rule in theogony, and the same procedure even enhances the value

<sup>27</sup> lbid., 69b.

of ethical forces. In philosophical thought, Eros is gradually transformed into the cosmic force of love, which manifests itself in the harmony of opposites. Harmony itself, once a goddess born of divine opposites, remains a valuational concept; and this is part of the reason that it increasingly replaces more colorless descriptions of combination, such as equilibrium, balance, and mixture, and even comes to control the temporal concepts of measure and rhythm, as it does in the *Timaeus*. Paired principles, again descended from gods, are no less charged with value. The divinities of Heaven and Earth become the forces of Light and Dark, and distant descendents like Sameness and Otherness still contain transformed concepts of good and bad. Even the apparently distinct conception of mind bears a relation to the traditional contraries, for it is opposed to matter somewhat as fire is to night, as good is to bad. But like love, which is paired with the evil of strife, mind becomes an ordering force separate from paired elements, concealing its history in its positive character. In any event, the incorporation into the world of a rational principle of order means the attribution to nature of purpose and also of beauty in a deeper sense than unreasoned symmetry.

Wherever we look the role of value in cosmology is confirmed. If it is mind in the case of Anaxagoras, it is justice in Anaximander, love in Empedocles, and harmony itself in Heraclitus. To the Pythagoreans in much greater degree than to other philosophers with the possible exception of Plato, the order of the cosmos was ethical and religious as well as physical and metaphysical. Number itself was valuational, for it was either the essential or the sole constituent of everything, apparently even of justice; the "holy tetractys" is simply the most prominent example of a general outlook. Perhaps more important still was the faith with which the Pythagoreans pursued the traces of number in the world; their search for harmony was part of a belief, and their science an expression of mysticism. There are remnants and counterparts of this attitude in the religious faith with which many scientists regard the mathematical order of the world, and in human dedication to science; the search for truth, although dispassionate in one sense, can become a way of life, and research a moral value.

Under the influence of the predominantly ethical outlook of Socrates, considerations of the good affected every department of Plato's thought, and the outspoken teleology of his world endows its order with profound value. Cosmic harmony is the direct expression of the Artificer's desire that the world be good. The place made for the cosmic soul is especially important, for in its very conception the soul is both good and beautiful, and it embodies these values in its harmony. Goodness characterizes not only the soul, however, but the whole cosmos; the creator wanted everything to be as like himself as possible, an end which he achieves through harmonious order in every part of his work. Even if the cosmogony of the

Timaeus—unlike those of myth and religion—is actually an allegory that expounds a cosmology by the fictional device of narration, the good in the cosmos is one of the properties that Plato earnestly seeks to explain. The ordered and ordering intelligence of the world soul will still be both good and a force for good, and this value will inform the material sphere also. But if the teleological conception of the cosmos is the most prominent basis for the value that inheres in its harmony, the conception of the cosmos as alive is important too, for only an organism can fully incorporate purpose and goodness. The cosmic soul, like the Artificer himself, is a transposition of an anthropological discovery; it carries over into the universe the consciousness of the human power of artistic creation. In terms of the cosmogonic narrative, only a cosmos that is alive can be made close in goodness to the creator.

The theory of classes and their interrelationship that Plato expounds variously in the Sophist and the Philebus contains a conception of harmony that more or less frees itself from cosmogony, and thus achieves an even greater generality than the harmonic ideas of the Timaeus. The kind of theory involved is an outcome of the critique of the Parmenides, which exposed defects in the conception of the Platonic Ideas and also in the Eleatic doctrine of Being that is fundamental to the Ideas. The denial of reality to anything but a monolithic Being that admits no opposite or difference also obstructs a positive result in the epistemological investigation of the Theaetetus: the definition of knowledge appears to demand the existence of non-being and falsehood. The difficulties reappear in the Sophist, where a solution is found in the notion of the mingling or communion of classes of existence.28 The Ideas have lost their transcendental character and become general conceptions or classes; and the possible relationships between such classes are defined: a given class may communicate or intermix with no other, with some others, or with all others. In particular, Plato selects five of the principal classes—being, rest, motion, the same, the other-and investigates their communion with one another. This undertaking is the proper subject of the art or science of dialectic. Music, or harmonics, is the science of knowing what mingles and what does not in connection with sound, and philosophy pursues the same kind of science with respect to classes.

The harmonic nature of dialectical inquiry becomes much more conspicuous in the related discussion of classes in the *Philebus*.<sup>29</sup> Plato does not select classes from those of importance, but instead undertakes to apply division to the whole of existence, and arrives at four classes: the infinite, the finite, the compound, and the cause. The class of the finite (or the definite or limited) includes the equal and the double, and any other ratio of number and measure; it is consequently able to end dif-

<sup>&</sup>lt;sup>28</sup> Sophist 252e-257a.
<sup>29</sup> Philebus 23c-27b.

ference and opposition, and to create harmony and proportion among different elements by the introduction of number. As a result, the compound or mixed class, which is the union or offspring of the first two, is essentially the class of the harmonious. The generation of this class is brought about by the fourth one, that of cause. The whole system is nothing more or less than a scheme of the generation of harmony, and it makes harmony the central characteristic of existence as well as of philosophy. In keeping with the notion advanced in the Symposium that opposed elements must be modified before they can be harmonized, the account in the *Philebus* does not combine opposed elements, but mingles the various opposites of the class of the infinite with the class of the finite to produce certain forms of harmonic nature. When heat and cold prevail, for example, the introduction of the principles of the limited takes away excess and indefiniteness, and infuses moderation and harmony. But of greater importance than the seasons, or than health and strength, are the ethical examples of harmony, for the Philebus is concerned primarily with determining the good, and the harmonic conceptions are completely general. Socrates, whose exceptional appearance in a late dialogue is undoubtedly due to the subject matter of the discussion, is particularly concerned with the applications to ethics: "O my beautiful Philebus, the goddess, methinks, seeing the universal wantonness and wickedness of all things, and that there was in them no limit to pleasures and self-indulgence, devised the limit of law and order. . . . "30 To the mixed or harmonious class belongs the mixed life of pleasure and wisdom, acknowledged as the best; and this class also contains the origin of bodily pleasures and pains, for living beings are made up of the natural union of the finite and infinite. They are, in a word, harmonic structures. When the harmony in animals is dissolved there is also a dissolution of nature and a generation of pain, while the restoration of harmony and return to nature is the source of pleasure. An analysis of the different kinds of pleasure and wisdom permits a more detailed determination of the constitution of the mixed life; and with the results of such an analysis as materials, Socrates mixes together the components of this best life after the fashion of artistic creation. The finished work would appear to be characterized most importantly by harmony, for the most precious element of the mixture and therefore the highest good of all is found in the appropriate proportions of the constituents. Without measure and the mean and the suitable, the mixture would not be a mixture, but only a confused medley. The second highest good also, which consists in the class of the symmetrical, the beautiful, and the perfect, has something of a harmonic nature; what is more, symmetry possesses aesthetic as well as ethical value, if we can characterize as aesthetic the highly abstract beauty of a category of the good. There can be no doubt, however, that the role

<sup>30</sup> Ibid., 26b-26c.

in which Plato has cast Socrates is very close to that of a musical composer. The answer to hedonism in ethics is not the denial of pleasure, but the application of harmony.

The Greek philosophy of man is long in developing principles and concepts peculiar to the human sphere; it borrows heavily from cosmology and natural philosophy, and as a result, the conceptions of harmony found in anthropology are often not original to the field. In their new setting, however, the borrowed ideas take on a new significance, and this in turn can affect cosmological thought. Anthropological ideas develop chiefly in the field of medical theory, which appears first in close association with Pythagoreanism. Alcmaeon of Croton,<sup>31</sup> a physician of southern Italy who was active in the early 5th century B.C., described health as a balance and a proportionate mixture of qualities in the body; the commensurability of the paired opposites in the mixture was based on the simple relation of equality. On the other hand, he conceived the soul as continually in motion; it was immortal because it was similar to the immortal heavens. But could this motion of the soul have been circular? Alcmaeon seems to imply that it is in holding that man dies because he is unable to join the beginning to the end. Accordingly, this philosopher may have influenced the Pythagorean theory of both body and soul, for Simmias's concept of the harmony of the body in the Phaedo could very well have been derived from the simpler notion of health as isonomia, just as the description of the soul in the Timaeus could easily go back to an earlier concept of circular motion. At the same time, neither bodily isonomia or harmony nor circular motion in the soul can be discovered in Pythagorean thought before Alcmaeon.

In the physical realm, of course, any general theory of harmony will apply equally to man and nature. In Empedocles's view, for example, man too is a harmony of the four elements caused by love.<sup>32</sup> Temporal and social and qualitative concepts of harmony are suggested also: love is responsible for harmonious actions and friendly thoughts.<sup>33</sup> In the Hippocratic writings,<sup>34</sup> health is discussed as a balance of the four qualities—cold, hot, wet, dry—which, like the Empedoclean elements, are also found in nature, specifically in the seasons. Hippocratic medicine typically viewed health against the background of physical environment, and regarded climate as the determinant of bodily constitution. This was actually a cosmic connection, since antiquity knows no distinction in principle between meteorology and astronomy. Thus the cyclic predominance of the qualities in man follows their succession in the seasons, and the

<sup>&</sup>lt;sup>31</sup> See Burnet, op. cit., pp. 193-196, Diels and Krantz, op. cit., Vol. I, Ch. XXIV, and Kirk and Raven, op. cit., Ch. VIII.

<sup>32</sup> Frg. 20, 21, 23, 26.

<sup>33</sup> Frg. 17.

<sup>34</sup> Much of the Hippocratic corpus is conveniently available in the Loeb Classical Library edition.

correspondence between world and man is deepened into a causal connection. Similarly in the *Nature of Man*, which according to Aristotle was written by Polybus, the son-in-law of Hippocrates, health is described as an equilibrium of four humors—black bile, yellow bile, blood, and phlegm—and in each season a different humor predominates. In later times, these theories were complemented by Galen's somewhat different conception of the four temperaments, each of which was a blend of qualities and elements and humors.

Temporal concepts of harmony are more at home in the human than in the natural province; the Hippocratic writings often bring rhythm under the head of harmony. There are examples in the progress of fevers, which revealed distinctive numerical patterns in the recurrence of critical days, thus permitting confirmation of the symptoms of the disease and making prognosis possible. Such patterns were specifically conceived as ordered numerical progressions of a harmonic nature. Health too was brought within the sphere of temporal harmony, for it was signified to the physician when he judged the rhythms of the pulse and of breathing to be harmonious. Most striking of all is the Pythagorean element that enters the discussion of embryology.<sup>35</sup> The growth of the embryo followed a harmonic pattern of days; particular stages of development were reached in specified times. The embryo was viewed as a musical instrument, and embryonic development became a musical performance.

The concept of the harmony of the body, as it developed in the Pythagorean-Empedoclean-Hippocratic tradition of philosohpical medicine, receives its most systematic exposition in the speech of Eryximachus in Plato's Symposium.<sup>36</sup> Since the Symposium deals with various types of love and their relative values, Plato's physician advances the notion of two kinds of love, only one of which knows moderation and thus leads to harmony while the other (which is clearly Empedoclean strife in disguise) is evil and leads to excess. But the important point here is the generality of this ethical basis of harmonic structure; although love is a specifically human concept in origin, it becomes the foundation for harmony of every type. The theoretical analysis of harmony also, which we have discussed above, applies with equal force both to the harmony of nature and the harmony of man. If we add to these factors the causal role of the seasons and the weather, and the harmonic conception of rhythm, the full breadth of the medical theory of harmony becomes apparent. The generalization of this theory—which reaches here and there into astronomical, religious, social, and qualitative concepts of harmony—is the main achievement of the discourse.

An important theory of the harmony of the soul is advanced in Plato's

<sup>&</sup>lt;sup>85</sup> Armand Delatte, "Les harmonies dans l'embriologie hippocratique," Mélanges Paul Thomas (Bruges, 1930).

<sup>36</sup> See note 23, above.

Phaedo 37 by the Theban Simmias, who is a disciple of Philolaus. He maintains that the soul is a harmony of the body, and illustrates his meaning by comparing the body to a lyre. Although the idea is materialistic, it is not completely unable to account for certain cherished properties of the soul; even though Simmias makes harmony dependent upon physical materials, he recognizes its incorporeal and divine nature. The conception is thoroughly Phythagorean as far as number and harmony are concerned, but it is quite the contrary in its insistence on the soul's mortality, curiously contradicting the Pythagorean belief in metempsychosis. The physical world becomes a basis of explanation in a realm long since recognized as fundamentally different, and that is why Socrates (the man chiefly responsible for formulating the Western concept of the soul) advances a series of detailed refutations.<sup>38</sup> These cannot be taken to imply, of course, that he opposes the notion that the soul is harmonic or harmonious in nature; he takes issue only with the particular idea that the body furnishes the elements of such a harmony.

In the Republic Plato regards the soul as tripartite;<sup>39</sup> it consists of rational, spirited, and appetitive principles. Temperance is a harmony between these three parts, a condition in which the rational principle exercizes control over the other two. Discord is equivalent to evil. The structural aspect of the conception becomes still clearer in the comparison between the principles and the strings of a musical instrument.<sup>40</sup> Plato also considers just the relation between the rational and spirited parts.<sup>41</sup> Ostensibly he is then concerned with a different kind of harmony, that between soul and body, which is effected by the action of music on the one and gymnastics on the other; but he actually regards the body only as a tool by means of which gymnastics affects the spirited principle of the soul, while music acts on its rational or philosophical principle. Thus the spirited part of the soul is brought into harmony with the rational part; it is adjusted—like the string of a musical instrument, Plato says—through gymnastics.

A much more elaborate picture of the harmony of the soul is found

<sup>&</sup>lt;sup>37</sup> Phaedo 85e-86d. It is a considerable step from Alcmaeon's concept of bodily health as an isonomia of pairs of opposed qualities to Simmias's concept of the soul as a harmonia of the body; for one thing, the simple balance of equals must be supplanted by the proportions of harmonic theory. Yet in his account, Simmias clearly leans on medical theory, and it is quite possible that the influence of Alcmaeon or of Hippocratic medicine on Pythagorean thought is responsible for his views. Medicine could logically bring about a materialistic transformation of religious ideas. As far as the general notion of the mixture of opposites is concerned, even Aristotle is doubtful whether Alcmaeon or the Pythagoreans may be credited with priority (Metaphysics I.5: 986a.22-986b.4).

<sup>38</sup> Phaedo 91c-95a.

<sup>39</sup> Republic 439-444.

<sup>40</sup> Ibid., 443d-443e.

<sup>&</sup>lt;sup>41</sup> *Ibid.*, 410*b*-412*a*.

in the Timaeus. 42 Like the world soul, the human soul is blended of Sameness, Otherness, and Existence, which is itself a compound of Indivisible Existence and Divisible Existence; but in man these constituents are somewhat diluted. Again as he did in the case of the cosmic soul, the Artificer divides the compounded material into a series of quantities arranged in order and size according to the double tetractys and the Dorian diatonic scale, and sets up the group of revolving circles spaced according to the same tetractys. This operation does not complete the construction of the human soul, however, as it does that of its cosmic counterpart, but yields only its rational or divine part; the work is then given over to the created gods (who in general are the artisans of the realm of necessity) so that they may complete it by constructing the mortal parts of the soul—its emotional and appetitive parts-from a harmony of the four sensible elements. The three sections of the soul, housed appropriately in the head, thorax, and abdomen, form an additional harmony among themselves, which, as in the *Republic*, is characterized by the control of reason over emotion and appetite. Dominance of one of the constituents of the harmony is found in the rational part of the soul also, where the circle of the Same, the outermost one, is given dominance over the circles of the Other.

Attention need hardly be called to the valuational aspect of harmony in man. While nature is generally equated to the physical world and even thought of as inanimate, man is conceived of at least as early as the 5th century B.C. as a combination of the two vastly different entities of body and soul, and the large place of ethical values is consequently insured. The ordered state of the body means physical health; the ordered state of the soul means mental and emotional health, and also reason. Thus harmony is more obviously a good in man than in the cosmos, where its full value hinges upon our acceptance of a teleological and organic view of nature.

The ethical value of human harmony takes its most prominent form in the harmony of virtue, which is discussed frequently by Plato. To the extent that virtues are considered as residing in the soul, they are part of the conception of the harmony of man; but such a conception is very readily transferred to society and to the world, and in its extreme form becomes the abstract ethical harmony of the *Philebus*. Another tendency of the harmony of virtue is that it easily loses its structural and quantitative character and turns into a generalized equilibrium and quieting of conflicting desires and feelings in the soul, and finally into a purely qualitative "harmony of life" associated typically with a feeling of joy or happiness. Harmony is called joy as early as Empedocles, although in his case the explanation lies in the basic role of love. And in the fragmentary writings of Democritus, both social harmony and also the joy that results

<sup>42</sup> Timaeus 41c-42a, 69c-72d.

from a harmonious life appear in a completely figurative light, since they are unaccompanied by any cosmological or mathematical conceptions of harmony. Yet Plato often harmonizes and weaves virtues in a quite specific sense; the harmony of the virtues in the Republic has a literal meaning, and justice and temperance consist in fact of harmonized constituents.<sup>43</sup> The consideration of virtue even uncovers the theoretic fact—so wonderfully illustrated in musical concord—that the components of a harmony (in this case justice) must preserve their individuality in spite of their relationship; harmony is not fusion.<sup>44</sup> In the soul itself, the harmony of the principles is a close parallel to the harmony of qualities, elements, or humors in the physical world.

Society can be thought of as occupying a middle ground between man and the world of nature. Modes of thought and conceptual models flow back and forth among all three fields, and ideas of harmony are inevitably imported into the social sphere from both the others. If the connection between society and the natural world appears to be especially influential in early Greek thought, the relationship between society and man becomes more important in classical times. A conspicuous concept deriving from the legal sphere and entering cosmology is that of justice and retribution; but conversely, Solon's concepts of justice were formulated partly as a parallel to his notions of law in nature. But as far as the harmony of society is concerned, concepts are derived mostly from anthropology. Plato regards society and the individual as parallel; in general, if harmony characterizes the relationships within man, it equally characterizes those between men. Lovers pass their lives in harmony, 45 but the bad, because they are at variance and enmity with themselves, are not in union or harmony with one another.46 The harmony of society is especially important in the Republic, where it occurs in a variety of forms. There are four classes of society: gold, silver, bronze, and iron; and in these are to be found the larger social counterparts of the principles contained in the individual human soul. Indeed the whole motivation of the dialogue depends upon this parallel, for virtue is to be examined as it occurs in the state, in the hope of better comprehending it in its more conspicuous form. Plato projects a detailed correspondence between individual and state. In both spheres, harmony is defined in much the same terms; the musical scale provides the formal basis, with its connection between high, low, and middle tones, and its fitting together of all the intermediate degrees. This type of relationship characterizes the natural order of the principles in man, and it has a particular illustration in the order of the three parts of the soul. Temperance in the individual is a

<sup>&</sup>lt;sup>43</sup> See note 40, above.

<sup>44</sup> Republic 441d-443e.

<sup>45</sup> Phaedrus 256b.

<sup>46</sup> Lysis 214c-214d.

harmonious relationship; justice in human nature, both in body and soul, means that the elements within man cooperate and do not mutually interfere. And in society also, temperance "runs through all the notes of the scale, and produces a harmony of the weaker and stronger and the middle class, whether you suppose them to be stronger or weaker in wisdom or power or number or wealth, or anything else."47 Like musical tones, which have their specific identities and functions in music, each element of man or of the state does its own work, not interfering or coalescing with the others, but cooperating to form the harmony of temperance and justice. Throughout the dialogue the conceptions of harmony are so numerous and so important that they actually govern the argument and provide a basis for its organization and aesthetic form. Even mathematical details, such as the law according to which human births are best regulated, are often in some degree harmonic in nature; but most symptomatic of all, the central concept of justice, traditionally conceived as a temporal balance and compensation, turns out upon investigation to be a form of harmony. Thus the Republic arrives at a view of society that is parallel to the view of macrocosm and microcosm achieved later in the Timaeus.

Accordingly it is possible for conceptions of harmony to facilitate the transfer of concepts between these fields, giving structure and substance to borrowed models of thought and making them more precisely suited to their explanatory purpose. But the correspondences between man and society and nature, and those between body and soul also, come to be regarded as additional types of harmony, such as the harmony between society and cosmos, or between man and cosmos, or between body and soul. If we take into account as well the harmonic conceptions of the arts, the world of experience assumes a remarkable symmetry, the detailed form of which is due to the almost numberless ramifications of harmonic ideas. Both the multitude of meanings and the extent to which they correspond are remarkable. The musician creates harmony in the pitch and duration of tone and in gesture; man creates harmony in the conduct of his life; the statesman creates harmony in society; the Demiurge creates harmony in the cosmos; the philosopher creates the harmony of dialectic and the music of discourse. These are all artists or scientists—the meaning is the same—proceeding on the basis of knowledge and imposing order on their materials. They all have a clear purpose in mind; and, in this context, they neither rely on inspiration nor imitate mere appearance. Instead they have probable opinion, based on experience, of the nature and properties of their materials; and true knowledge, based on reason, of the models to which they work.

Heraclitus's words, the hidden harmony is better than the visible one, can be taken to express the anti-sensuous tendency of harmony; while in

<sup>47</sup> Republic 432a.

terms of the Platonic conception of Ideas, the highest value will reside in a harmony that transcends the material world altogether. In such a setting, ideas of harmony in art become strangely equivocal with respect to aesthetic value. That sense will give way to reason follows almost as a corollary from Plato's abstract concept of beauty, which paradoxically is itself expressed by Socrates with great emotional power and sensuous beauty in the *Phaedrus* and the *Symposium*. Here the artist and the philosopher in Plato are at odds, and they meet only in the more severe beauty of the later dialogues.

As concrete species of harmony, all the sensible arts must manifest the abstract features of harmonic order, almost in spite of their perceptible nature. There was no difficulty about applying notions of harmony to visual art; in the middle of the 5th century, Empedocles already describes the painter's mixture of pigments as a harmony.48 Plato's discussions of harmony in art are often completely general. In the Statesman, for example, the highest class of the good—which the Philebus determines to be that of measure and the mean—is revealed as the foundation of art.49 The very existence of the arts depends on the possibility of measuring more or less, and of measuring them not only with respect to one another but also with a view to attaining the mean; while the excellence or beauty of every work of art is due to the observance of measure. Thus in its application to art, the conception of harmony can give rise to aesthetics; the superior beauty of rational harmony comes to reside in the sensible work, and provides the ultimate basis of perceived beauty. This has a counterpart in the inherence of absolute beauty in the physical beauty of a human being, which is described in one of the most moving passages of the Phaedrus. The same aesthetic is applied to music in the Philebus: "And whereas the high and low, the swift and the slow are infinite or unlimited, does not the addition of the principles aforesaid introduce a limit, and perfect the whole frame of music?" 50 Since the discussion is designed to illustrate the harmonic division of existence into classes, music is understandably so apt an illustration that it has the force of the general conception as well as of a particular instance. The Philebus identifies not only metaphysics with aesthetics, however, but regards the highest ethical values also-measure and the mean and symmetry-as aesthetic in nature. Even the element of pleasure is present, for the mixture of the finite and infinite yields not only the beauties of body and soul, but all the delights of life.

If the *Philebus* is concerned with the inherently harmonic nature of metaphysics and ethics, the *Gorgias* points to the possible ethical implications of harmony. All artists dispose things in order, and compel one part

<sup>48</sup> Frg. 23.

<sup>&</sup>lt;sup>49</sup> Statesman 284a.

<sup>50</sup> Philebus 26a.

to harmonize and accord with the other parts; but when the artist's activity affects man in substantial degree, it understandably loses its purely aesthetic character. The trainer and physician give harmony and order to the body, where they have the effect of health and strength; and similarly, the true rhetorician and the man who is morally good give harmony and order to the soul, where their effect is temperance and justice, or in a word, virtue.<sup>51</sup> Thus we arrive again in the familiar territory of the ethical nature of harmony.

But art often suffers by comparison with the precise qualities of abstract harmony. In the *Philebus*, for example, music appears as the paragon of dialectic method, as the science of tone; and during the division of pleasure and wisdom into their species, it is placed, quite consistently, not among the pleasures, but among the sciences and arts, the classes of wisdom and knowledge. But this context is its undoing, for it is assigned to the impure variety of the productive or handicraft class of knowledge (which is opposed to the educational class).<sup>52</sup> As compared to carpentry, for example, music is less exact in its results, and full of empiricism. "Sounds are harmonized not by measure but by skillful conjecture; the music of the aulos is always trying to guess the pitch of each vibrating note and is therefore mixed up with much that is doubtful, and has little which is certain."

Many of Plato's conceptions of harmony can conveniently be brought under the head of the general notion that philosophy itself is harmonic or musical. A simple instance is that harmony can become a criterion of consistency in reasoning, as this is manifested in the agreement of ideas. "Certainly there should be harmony," says Socrates humorously in the Phaedo, 53 "in a discourse whose subject is harmony." And in the Gorgias 54 this conception is combined with the idea that discourse or dialectic in general is music; Socrates warns Callicles that if he does not refute the thesis that has been advanced he will never be at one with himself, and his whole life will be a discord, while Socrates, on the other hand, would rather that his lyre be inharmonious and that there be no music in the chorus he provides, or that the whole world should be at odds with him and oppose him, than that he should be at odds with himself and contradict himself. The abstract nature of the conception of harmony is revealed here in the lower value placed on the musical as opposed to the logical variety. This is also a feature of the reference to harmony in the Laches: 55 the true musician is attuned to a fairer harmony than that of the lyre, for he has arranged in his life a harmony of words and deeds which is in the Dorian mode, the true Hellenic one. The concept so ingeniously developed

<sup>51</sup> Gorgias 503-504.

<sup>52</sup> Philebus 55c-56c.

<sup>58</sup> Phaedo 92c.

<sup>54</sup> Gorgias 482b-482c.

<sup>&</sup>lt;sup>55</sup> Laches 188c-188e, 193d-193e.

here is really a variant of the notion of consistency in argument. As these examples show, the agreement of ideas, or of words and deeds, can also become a harmony in human life, thus furnishing a parallel—although it lacks the suggestion of mathematical structure—to the harmony of the parts of the soul, which is equated in the *Republic* to a harmonious life. The philosopher in particular is thought of as having a harmonious nature.<sup>56</sup>

Actually the whole method of division in discourse, of the determination of genera and species, which Plato comes to regard as central to dialectic, is also a harmonic process; as we have seen, the application of the method in the *Philebus* is probably the most all-embracing and abstract example of harmony in the whole of Plato's writings. Preceding this harmonic division of existence there is a methodological discussion that makes use of music as a remarkably appropriate illustration,<sup>57</sup> and thus serves to confirm the inherently harmonic nature of philosophic method.

With the conception of philosophy as an example of harmony, or more typically, as the highest music, a circle closes in the history of harmonic ideas, and the abstract meaning of harmony, which music so importantly determined, leads back to the concept of actual sonority; for philosophy can be thought of as music almost as much in a literal as in a figurative sense. The study of harmonics crystallizes the conception of harmony in its abstract significance; Socrates complains insistently in the Republic 58 about those who limit the discipline to relationships that are audible, and he characterizes the subject as fundamentally different from the study of music. But harmonics, which scorns sonority, leads to the ultimate goal of education, the "hymn of dialectic." That this peculiarly equivocal conception of harmony and music had a central position in Plato's thought is suggested by the number of times it occurs in his writings and by the large variety of forms it takes. Socrates is an aulos player whose art of dialectic is a peculiarly persuasive music; a potential victim must stop up his ears as he would to the song of the sirens. 59 The last essay of Socrates in the art of dialectic is his swan song.60 He at first could not understand the injunction he often received in his dreams to compose music, for he had always practiced philosophy and this was certainly the

The underlying conception can be that of a mean value itself as a harmony; thus a harmonious voice is one that has a well chosen intermediate nature in respect of pitch and loudness, although it can also be one that is simply pleasant in quality. In such qualitative conceptions of harmony, which proliferate endlessly, there are generally some vague implications either of mean values or of compatible constituents, but the mathematical structure is really of no importance and cannot be specified.

<sup>&</sup>lt;sup>57</sup> Philebus 16c-17. <sup>58</sup> Republic 531a-531c.

<sup>&</sup>lt;sup>59</sup> Symposium 215b-216a. <sup>60</sup> Phaedo 84e-85c.

highest and best music.<sup>61</sup> Similarly, in the myth of the grasshoppers that Socrates narrates in the *Phaedrus*,<sup>62</sup> Calliope and Urania are the Muses concerned with philosophers and their music, with heaven and thought, and they themselves have the sweetest utterance. Invocations to the Muses are in fact common in the dialogues, and Plato undoubtedly regarded his works as a superior kind of poetry.

That these conceptions of the musical nature of philosophy have a literal meaning is indicated by their concern with musical effects upon man, for it is primarily in acoustic qualities and the significance of sung words that the influences of music reside. Thus music and harmony can separate in meaning, and the role of actual sound will become vastly different in the two concepts. In the case of harmony, intervals and scales exist merely as the example par excellence of a conception of order to which the question of sonority is typically irrelevant; while in the case of music, whether as the concrete composite of melody and poetry and dance, or as the broad sphere of the Muses (which encompasses also astronomy and forms of prose, and becomes synonymous with culture as a whole), tone is present almost without exception as an essential constituent. These are certainly the arts of rhythm, or of time; but the fact that space is subsumed in the classification by the inclusion of dance and astronomy does not mean that tone is an accidental feature. Not only is tone the most tangible embodiment of temporal rhythm, but there is very little evidence of a separate art of pure dance in Greece, while language is almost exclusively still spoken, and even astronomy is concerned with phenomena often conceived as tonal. Thus the harmony of the spheres is silent, but the music of the spheres is sonorous, which is to say that there are two sides to the Greek conception of the cosmos, just as there are two aspects of the Pythagorean outlook: scientific and poetic. As a corollary, the Greek division of the arts was not into the categories temporal and spatial, but into temporal and static, of which the first group can equally well be called rhythmic or tonal, and there is a profound significance in the tradition that makes Mnemosyne the mother of the Muses. The distinction exists in its most distilled form in the difference between the concept of philosophy as music, which is characteristic of Socrates and the mature Plato, and the concept of dialectic as harmonic, which we find in the *Philebus*. The one points to concrete music, with its ethical effects, while the other has an abstract beauty that derives from its metaphysical background. It is as though the temporal aspect of harmony gave rise to all the musical arts, this branch of development coming under the head of rhythm (which always tended to be an idea coordinate with harmony rather than an acclimated part of it), while the static aspect of harmony (which is connected with the pitch component of music and

<sup>61</sup> lbid., 60d-61a.

<sup>62</sup> Phaedrus 258e-259.

more faithfully transmits the meaning of the word) became increasingly identified with science and metaphysics.

In the writings of Plato, Greek conceptions of harmony achieve their maximum diffusion and influence, leaving no major sphere of philosophy unaffected, and in a sense fulfilling Heraclitus's thesis of the universality of the harmonic logos. This universality is no longer a characteristic of the outlook of Aristotle and the Peripatetic philosophers; harmony remains a versatile conceptual tool, but various factors—an increased empiricism, the denial of the transcendental nature of numbers and the Ideas, a more objective comprehension of philosophic problems—conspire to contract its meaning, and to restrict it to a particular kind of mathematical pattern useful in analysis.

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The Growth of the Greek 'Apmoniai  $\,$ 

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## THE GROWTH OF THE GREEK 'APMONIAI'

In Book III (398 D-399 E) of the *Republic*, where Plato is discussing the musical education of his  $\phi \dot{\nu} \lambda \alpha \kappa \epsilon s$ , he speaks of certain  $\dot{\alpha} \rho \mu o \nu i \alpha \iota$  by name. It is well known that Aristides Quintilianus has preserved a list of  $\dot{\alpha} \rho \mu o \nu i \alpha \iota$ , with their names and sequences of intervals, which he declares to be the  $\dot{\alpha} \rho \mu o \nu i \alpha \iota$  named in Plato's *Republic*.<sup>2</sup> I transcribe these sequences of intervals in descending order, as follows:

Dorian	•	2	1	1	1	2	1	1	1	Mixolydian .	3	1	$\frac{1}{4}$	1	1	1	1
Phrygian		1	$\frac{1}{4}$	1	1	2	1	1	1							_	_
Lydian	•	1	2	1	1	1	2	1		Ionian	1	$1\frac{1}{2}$	2	1	1		

Before these sequences can be translated into notation, their relative pitches must be ascertained. Recent scholars have established beyond reasonable doubt that the Greek ἀρμονίαι were modal, not tonic, in character; but in reacting against the untenable 'key-theories' of Monro and Macran, they have rejected incontrovertible evidence that different ἀρμονίαι had different pitches or registers. The terms σύντονος and ἀνειμένη—taut and slack—used as technical terms in a music of string instruments, could not possibly mean anything but high and low; and Aristotle's statement that old men cannot sing τὰς συντόνους ἀρμονίας cannot be otherwise explained without absurdity.<sup>3</sup>

Accordingly, we must pitch the Syntonolydian relatively high; and since Damon identified the Ionian with the ἐπανειμένη Λυδιστί,⁴ the Ionian must be pitched low. The later Mixolydian was the B mode, lying low on the later diapason al-A. But Aristophanes, after quoting a poem by Lamprocles, adds: ἐντειναμένους τὴν ἀρμονίαν ἢν οἱ πατέρες παρέδωκαν: and the Scholiast remarks: ὡς συντόνου οὖσης τῆς παλαιᾶς ἀρμονίας, οὐκ ἀνειμένης, ὡς οἱ νέοι ἐπενόησαν—the old ἀρμονία was high, not low, as the moderns afterwards conceived it.⁵ Now Lamprocles is associated with the Mixolydian ἀρμονία.⁴ It is therefore probable that the Mixolydian is the ἀρμονία here referred to; and we may provisionally suppose that the old Mixolydian was pitched on the higher b octave.

Aristides' scales may now be arranged in alphabetical notation, as follows:6

Dorian . Phrygian		•			e <sup>1</sup>	ď	сБb сБb	a a		fēe fēe	d d	
Lydian . Mixolydian	•	•	b¹		ēe¹ fee	ď,	срр	a		fē	_	
Syntonolydian Ionian .	i	•		gl	e <sup>i</sup>	u u	сБъ	a	g	е		CBB

Aristides mentions these  $\dot{a}\rho\mu\nu\nu\dot{l}a\iota$  because their scale-divisions differed somewhat from those of the later standard types. He had, of course, no evidence that Plato, in the Republic, was thinking of these enharmonic genera rather than of the diatonic forms of the same names. As a matter of fact, Plato has told us that he strongly

- <sup>1</sup> For a fuller discussion of the musical side of this subject, v. my forthcoming article in the *Music Review*, Feb. 1943.
- <sup>2</sup> The antiquity of these  $a\rho\mu\nu\nu ia\iota$  has been ably demonstrated by J. F. Mountford, C.Q., 1923, and J.H.S. 1920.
- <sup>3</sup> Ar., Politics, 1342<sup>b</sup>. On Pratinas and Lasos, v. infra, p. 99. Monro (Modes of Greek Music)

and Macran (in his edition of Aristoxenus) collect the evidence for the pitching of the ἀρμονίαι, though they draw false inferences.

- 4 Ps.-Plut., De Musica, 16.
- <sup>5</sup> Clouds, 967-8.
- <sup>6</sup> Transcriptions are in the natural key.  $\bar{\mathbf{e}}$  represents the quarter-tone above  $\mathbf{e}$ . My notation repeats at  $\mathbf{D} \mathbf{d} \mathbf{d}^{\mathbf{l}}$ .

disapproved of quarter-tones: τὰς γὰρ ἀκουομένας αὖ συμφωνίας καὶ φθόγγους ἀλλήλοις ἀναμετροῦντες ἀνήνυτα πονοῦσι . . . καὶ γελοίως γε, πυκνώματ' ἄττα ὀνομάζοντες καὶ παραβάλλοντες τὰ ὧτα . . . οἱ μέν φασιν ἔτι κατακούειν ἐν μέσω τινὰ ἤχην, καὶ σμικρότατον εἶναι τοῦτο διάστημα, ῷ μετρητέον, οἱ δὲ ἀμφισβητοῦντες ὡς ὅμοιον ἤδη φθεγγομένων, ἀμφότεροι ὧτα τοῦ νοῦ προστησάμενοι. According to Plato, music should be the study of σύμφωνοι ἀριθμοί, perfect consonances—not of irrational and indeterminate microtones. He would never have educated his Guardians on enharmonic music. That he admired the diatonic genus we know: he used it for his ideal scale in the Timaeus, and also (if the word συμφωνεῖν implies perfect consonances) for the scale the Sirens sang in the Dream of Er. Since Aristoxenus says the diatonic was the oldest of the genera, and since Pseudo-Plutarch² refers to a diatonic Mixolydian ἀρμονία existing in the early fifth century, it is beyond doubt that the ἀρμονίαι of Aristides had diatonic forms as well as enharmonic.

But a diatonic appoola cannot immediately be deduced from the enharmonic form which bears the same name. A comparison between the later standard modes of the two genera will show that the nominal correspondence between the two is purely conventional and artificial. The original enharmonic scale (as the pseudo-Plutarch shows)<sup>3</sup> was in the Dorian octave only. Its ultimate form, **E'** CBB A FEE, was cut up into other modes, which were named according to the pitch-order of the diatonic modes. But a gapped genus, treated in this way, cannot possibly preserve the same registers as the diatonic modes in every case; and there is no necessary structural connexion between the two. Thus the bottom notes of the nominally corresponding octaves diverge as follows:

Diatonic . . . G F E D C B A Enharmonic . . . F E E C B B A

Aristides' apµovia, which are half-formed ancestors of the later enharmonic modes, may be expected to show somewhat similar divergences from the diatonic forms whose names they have borrowed. Still, so far as the incidence of the gaps and quarter-tones will allow, they will no doubt correspond roughly to the registers of these diatonic forms.

The following points may be noticed about Aristides'  $\delta\rho\mu\nu\nu\ell\alpha\nu$ . Two of them stop short of an octave, and one—the Mixolydian—has a gap from  $\mathbf{b}^{\mathbf{l}}$  to  $\mathbf{f}^{\mathbf{l}}$ . This cannot be explained by the ordinary gapping of enharmonic forms, which would not occur in the diatonic genus. The Aristoxenian term  $\delta\pi\epsilon\rho\beta\alpha\tau\delta\nu$ , meaning a gapped or transilient scale, would be applicable here.

But no scale can be interpreted unless we know which notes a composer would treat as structurally important in his tunes. Music, as Parry said, comes before scales; and Heraclides Ponticus has observed this historical fact in his definition of a  $\hat{a}\rho\mu\nu\nu la$ :  $\hat{\tau}\hat{\eta}\nu$   $\hat{a}\gamma\omega\gamma\hat{\eta}\nu$   $\hat{\tau}\hat{\eta}s$   $\mu\epsilon\lambda\omega\delta las$   $\hat{\eta}\nu$  of  $\Delta\omega\rho\iota\epsilon\hat{\iota}s$   $\hat{\epsilon}\pi o\iotao\hat{\iota}\nu\tau o$   $\Delta\omega\rho\iota\nu \hat{\epsilon}\nu$   $\hat{\epsilon}\lambda o\iota\nu$   $\hat{\epsilon}\rho\iota\nu lav$ . That is, the consecutive note-series of the Dorian corpus of songs was called the

- 1 Republic, 531 A-C (cf. 617 B and Timaeus, 35 B). The quarter-tones were a later addition to the enharmonic style (cf. Appendix I, p. 103). That they were introduced within Plato's memory is strongly suggested by 'πυκνώματ' ἄττα ὀνομάζοντες', and by the dispute about the unit of measurement. If the Orestes fragment is authentic, Euripides was using them by 408 B.C. (cf. infra, p. 100).
- <sup>2</sup> De Mus. 16. He must mean the diatonic form, because the enharmonic could not have had (as he states) the opposite sequence of

intervals to the ἐπανειμένη Λυδιστί.

- <sup>3</sup> v. infra, Appendix I, p. 103. It cannot be too emphatically stated that the enharmonic and diatonic genera had (as one would expect of any two musical genera) different origins and histories. To expect the different genera of each mode to follow the same pattern or structure is fantastic. The modes of each genus are derived from the basic scale of that genus, not from the nominally related modes of another genus.
  - 4 ap. Athen. 624 D.

Dorian ἀρμονία. The ἀρμονίαι were not the rigid, independent scale-forms or συστήματα of later times: in fact, a ἀρμονία does not really mean a scale, any more than a 'mode' does. It means a style based on certain relations of notes. Aristides clearly and correctly describes ἀρμονία in terms of μελφδία, from which it is scarcely distinguishable; and Euripides practically identifies the two: μέλπει δ' ἐν δένδρεσι λεπτὰν ἀηδῶν ἀρμονίαν.<sup>1</sup>

Can we, then, discover anything about the principles of tune-making from which the approxima are derived?

In the *Problems*<sup>2</sup> we are told that a good tune recurs often to the  $\mu\acute{e}\sigma\eta$ . It is much disputed whether the  $\mu\acute{e}\sigma\eta$  is here to be understood  $\kappa\alpha\tau\grave{a}$   $\theta\acute{e}\sigma\iota\nu$  (relatively, as the fourth from the bottom note of any  $\acute{a}\rho\mu\nu\nu\acute{a}$ ) or  $\kappa\alpha\tau\grave{a}$   $\delta\acute{\nu}\nu\alpha\mu\nu\nu$  (absolutely, as the middle note of the Dorian Greater Perfect System). Obviously, the latter sense is meaningless in a modally varied music—and a glance at the  $\acute{a}\rho\mu\nu\nu\acute{a}\iota$  of Aristides is enough, apart from other evidence, to show that they do not belong to a single-mode music.<sup>3</sup> As a matter of fact, the  $\acute{o}\nu\nu\mu\alpha\sigma\acute{a}\iota$   $\kappa\alpha\tau\grave{a}$   $\delta\acute{\nu}\nu\alpha\mu\nu\nu$  is only the  $\acute{o}\nu\nu\mu\alpha\sigma\acute{a}\iota$   $\kappa\alpha\tau\grave{a}$   $\theta\acute{e}\sigma\iota\nu$  of the Dorian mode, on whose later predominance the Greater Perfect System is based.<sup>4</sup> Whether or not the author of the *Problems* was actually thinking of Dorian tunes, it is inconceivable that the  $\mu\acute{e}\sigma\eta$  ( $\kappa\alpha\tau\grave{a}$   $\theta\acute{e}\sigma\nu$ ) was functionally important in the Dorian  $\acute{a}\rho\mu\nu\nu\acute{\iota}a$  only, or that each  $\acute{a}\rho\mu\nu\nu\acute{\iota}a$  showed totally different conceptions of the primary intervals of tune-structure. Modal variety demands flexible treatment, but it would be unintelligible without certain principles of composition.

This, however, is not to say that the  $\mu \acute{e} \sigma \eta$  was a 'tonic'. The idea of a tonic is necessarily foreign to any kind of modal music. It was precisely what its name implies: a middle pivot-note. Aristides puts the  $\mu \acute{e} \sigma \eta$  in its place, among the other pivot-notes of Greek tunes.

The notes, he explains, which recur frequently in the tune, or which contain it at top and bottom, determine the character of the  $\delta\rho\mu\nu\nuia.^5$  In any tune, certain notes are more essential than others as clues to the mode or key: it is difficult to indicate the key of C major in a tune using the notes **a c f a!**, but easy in a tune using the notes **b c e g**. In Greek scales, the  $\mu\epsilon\sigma\eta$  with its fourth below and its fifth above are primary notes. The tuning of the  $\kappa\iota\theta\delta\rho a$  begins from these intervals—and intervals are, of course, important in a scale because they are important in a tune. That these top, middle, and bottom notes were important as melodic pivots is indicated by Aristides in his description of different traditional styles of  $\mu\epsilon\lambda o\pi o\iota \iota la$  as  $\nu\eta\tau o\epsilon\iota \delta\eta s$ ,  $\mu\epsilon\sigma o\epsilon\iota \delta\eta s$ , and  $\nu\pi\sigma\tau o\epsilon\iota \delta\eta s$ . The emphasis of the several pivots varied.

A well-balanced, clearly defined tune would balance itself round some, though not necessarily all, of these pivots. But consciousness of fourths and fifths does not at once imply consciousness of the whole intervening sequence bounded by these intervals. The tune, at certain crises, would jump from one pivot to another: it would not necessarily touch all the intermediate notes. Such a procedure is common

- <sup>1</sup> Phaethon, fr. 773 (N.).
- <sup>2</sup> 20.
- <sup>3</sup> The excellent work of Prof. J. F. Mountford and Mr. Winnington-Ingram (*Mode in Greek Music*) has sufficiently established this point.
- 4 Cf. the absolute use, in France or Italy, of sol-fa terms which were originally relative (v. infra, p. 102), on this subject.
- 5 57. 29; 58 ad init. Mr. Winnington-Ingram's interpretation of the former passage (op. cit., pp. 57-9) makes no sense to me. ἀρμονία and μελωδία are naturally connected in Aristides' account (as Mr. W.-Ingram afterwards admits,
- p. 60). Cf. for instance, 57. 18: ἤτοι κατὰ τὴν τοῦ συστήματος ἀγωγὴν τῆς ποιότητος μεταλαμβάνει, ἢ κατὰ τὴν ὑπερβατὸν μελῳδίαν τοῖς πλεονάζουσι τῶν ἦχων συνεξομοιοῦται.
- 6 19. 10, 20. 1.  $inalpha \pi \eta$  is the bottom note, a fourth below μεση: νήτη is the top note, a fifth above. παραμεση, a fifth above iπατη, gives another important interval which (we may conjecture) would be emphasized in the F mode, since that mode had no true μεση. The Greeks could enjoy the diabolus, but only as an abnormality (cf. Appendix I).

to the evolution of all music: tunes are not formed by stringing notes consecutively, but by leaping first to some primary interval, which is filled in afterwards.

With these points in mind, I shall put forward a hypothesis on which the growth of the diatonic ἀρμονίαι seems to me to be explained.

The Phrygian song sung on the banks of the Sangarius, or the Lydian song sung on the Maeander, was not very like the songs sung at Athens in the Phrygian or Lydian styles. In all their arts, the Greeks hellenized what was foreign, and civilized what was rustic or provincial. The Lydian  $i\rho\mu\nu\nu ia$ , by Heraclides' definition, was the anatomy of the Lydian  $\mu\epsilon\lambda\omega\delta ia$ . This anatomy was analysed by Greek ears, already used to a certain sequence of intervals, and was translated to Greek instruments already tuned to that sequence of intervals. To get a fair approximation to the Lydian style, the Greek made the song fit the notes he already knew: he need not change the basic scale of his  $\kappa\iota\theta\acute{a}\rho a$ , if he chose the right segment of that scale for the new song.

We will suppose that his  $\kappa\iota\theta\acute{a}\rho a$  could play eleven notes, normally tuned to the series  $\mathbf{g}^{\dagger}\mathbf{f}^{\dagger}\mathbf{e}^{\dagger}\mathbf{d}^{\dagger}\mathbf{c}$  b  $\mathbf{a}$   $\mathbf{g}$   $\mathbf{f}$  e  $\mathbf{d}$ . This Lydian song—let us imagine—occupied only the four notes  $\mathbf{a}$   $\mathbf{g}$   $\mathbf{f}$  e, and its chief recurrent note was the  $\mathbf{f}$ . So  $\mathbf{a}$   $\mathbf{g}$   $\mathbf{f}$  e became the register conventionally used at Athens<sup>2</sup> for 'Low Lydian' songs, and they were associated with the recurrent  $\mathbf{f}$ . Presently the Greek wanted to compose songs of his own in this style. He had his own Greek notions of composition, and of the importance of certain intervals in a tune. In particular, the tunes he wrote tended to touch the fourth below the middle pivot-note which he called  $\mu\acute{e}\sigma\eta$ . But the fourth below the Lydian  $\mathbf{f}$  was beyond the compass of his  $\kappa\iota\theta\acute{a}\rho a$ , whose bottom string was normally tuned to  $\mathbf{d}$ . However, the Lydian style did not demand that  $\mathbf{d}$ , so he tuned down his  $\mathbf{d}$  string to  $\mathbf{C}$ . This scordatura left him with a gap between  $\mathbf{e}$  and  $\mathbf{C}$ : his new 'Low Lydian'  $\acute{a}\rho\mu\nu\nu\prime a$  was  $\mathbf{a}$   $\mathbf{g}$   $\mathbf{f}$   $\mathbf{e}$   $\mathbf{C}$ .

This interpretation corresponds to the early high register of the Mixolydian  $\dot{a}\rho\mu\nu\nu\dot{a}$  indicated by Aristophanes and his Scholiast. But there is further confirmation of it. We are told that Lamprocles, in the early fifth century, first discovered that the disjunction of the Mixolydian  $\dot{a}\rho\mu\nu\nu\dot{a}$  lay at the top. What was Lamprocles doing? He was analysing the gap  $\mathbf{b}$ — $\mathbf{f}$  where the Mixolydian  $\dot{a}\rho\mu\nu\nu\dot{a}$  leaped off the upper edge of the charted notes  $\mathbf{g}^{\mathbf{l}}$ — $\mathbf{d}$  of the  $\kappa\iota\theta\dot{a}\rho a$ . Prolonging the existing sequence of intervals by repeating the lower Mixolydian tetrachord, he diagnosed the form of the  $\dot{a}\rho\mu\nu\nu\dot{a}$  as follows:  $\mathbf{b}^{\mathbf{l}} \parallel [\mathbf{a}^{\mathbf{l}} \mathbf{g}^{\mathbf{l}}] \mathbf{f}^{\mathbf{l}} \mathbf{e}^{\mathbf{l}} \mathbf{d}^{\mathbf{l}} \mathbf{c} \mathbf{b}$ . That is, the higher tetrachord was bounded by the omitted note  $\mathbf{a}^{\mathbf{l}}$ , while the disjunction lay between  $\mathbf{a}^{\mathbf{l}}$  and  $\mathbf{b}^{\mathbf{l}}$ .

My point is that when the high  $b^l$  had been produced by tuning up the  $g^l$  string, it left a real gap or hiatus in the known series of notes, charted on the  $\kappa\iota\theta\acute{a}\rho a$ . The space between the new  $b^l$  and the old  $g^l$  was unmapped, undivided,  $\mathring{a}\pi\epsilon\iota\rho o\nu$ : no

- <sup>1</sup> This scale is derived from my analysis and dating of the ἀρμονίαι (v. infra, pp. 98–9).
- <sup>2</sup> 'Athens' is to be understood as an inter-Hellenic cultural centre. Ionian musicians were of course among the leaders in the development from folk-song (Greek or barbarous) to a Greek Kunstmusik (cf. infra, p. 99).
- <sup>3</sup> This corresponds to Aristides' Ionian ἀρμονία (which was similar to the Low Lydian —v. infra, pp. 98 and 99–100).
- 4 Ps.-Plut. De Mus. 16. The disjunction is the tone which, added to the two similar tetrachords, makes up the octave.

analysis would have been necessary if the intervening notes had already existed on the  $\kappa\iota\theta\acute{a}\rho a$ . What Lamprocles discovered was the principle of tetrachordal analysis of the  $\acute{a}\rho\mu\nu\nu\acute{a}\iota$ , by which the gap could be filled in. This was the first step towards the continuous two-octave diapason of later times, and towards the completion of the  $\acute{a}\rho\mu\nu\nu\acute{\iota}a\iota$  as full octave-species.

I will recapitulate my explanation of the growth of the early ἀρμονίαι:

- (1) Foreign or provincial songs were assimilated to a common set of instruments with a standard scale—each corpus of songs being adapted to the segment of that scale which best fitted it. This was how the ἀρμονίαι acquired their different conventional pitches.
- (2) Greek principles of composition demanded certain intervals, relative to the existing pivots of the tunes, as fundamental in balancing the song and defining its ἀρμονία. But since the compass of the κιθάρα was limited, such intervals could not always be obtained on its normal tuning. If the middle pivot of a song lay near the edge of the compass of the κιθάρα, the top or bottom strings had to be tuned up or down to the required note, leaving a gap in the ἀρμονία of the song.

This hypothesis not only explains how some  $\delta\rho\mu\nu\nuia\iota$  came to be gapped, but also combines the ancient evidence for the modal character of the  $\delta\rho\mu\nu\nuia\iota$  with the ancient evidence for their distinctive pitches. In combining both sets of evidence, it does not involve the anachronistic assumption that the  $\delta\rho\mu\nu\nuia\iota$  were complete octave-species of a 15-note system, at a time when no such system can be postulated. On the contrary, it explains how the 15-note system grew together gradually, by filling in the gaps of such transilient  $\delta\rho\mu\nu\nuia\iota$  as the Mixolydian.

It is now possible to guess the diatonic forms of Aristides' other  $\delta\rho\mu\nu\nui\alpha\iota$ . I transcribe them beneath the normal diatonic tuning of the  $\kappa\iota\theta\delta\rho\alpha$ , from which they are derived:

Normal Scale		g١	$f^{\mathfrak{l}}$	el	d١	С	b	a	g	f	e	d	
Dorian .				e!	d1	C	b	a	g	f	е	d	
Phrygian .	.				đ١	C	b	a	g	f	е	d	
Ladian	.		f!	ei	ď١	C	b	a	g	f			
Mixolydian.	.   b'		f	e!	d!	C	b						į
Syntonolydian	.	g١	fi	e!	d!	C							
Ionian .	.						1	a	g	f	е		C

The first three  $\delta\rho\mu\nu\nu ia\iota$  fall wholly within the normal compass of the  $\kappa\iota\theta \acute{a}\rho a$ , so that all the notes of a continuous octave are available if required. Dorian songs, indeed, use a ninth note below the  $\delta\pi\acute{a}\tau\eta$  **e**. The Lydian enharmonic version of Aristides is the same as the later standard enharmonic form, running from  $\mathbf{\bar{e}}^{\dagger}$  to  $\mathbf{\bar{e}}$ , which was called by the name of the diatonic  $\mathbf{F}$  mode: it is therefore to be presumed that the diatonic forms also correspond.

The later enharmonic forms show quarter-tones falling below the diatonic  $i\pi\acute{a}\tau a\iota$  in the case of the **F** and **C** modes. Accordingly, the Syntonolydian and Ionian  $\acute{a}\rho$ - $\mu o\nu \acute{a}\iota$  are best interpreted as stretching to the pivot-notes **c** and **C** respectively, without the  $\pi \nu \kappa \nu \grave{a}$  be and **BB**. Both, in fact, seem to centre round the pivots **C**, **F**, and **G**; and since Damon identified the Ionian with the  $\emph{e}\pi a\nu \epsilon \iota \mu \acute{e}\nu \gamma \Lambda \nu \delta \iota \sigma \tau \acute{e}$ , it is not surprising to find that it also resembles the  $\sigma \acute{\nu}\nu \tau \sigma \nu \sigma s$   $\Lambda \nu \delta \iota \sigma \tau \acute{e}$  an octave higher. But Ionian songs, for some traditional reason, went up to the **A**; moreover, they had

i Any interpretation of such fragmentary ἀρμονίαι must be provisional. For their later history, v. infra, p. 100; but their completion as octave-species was somewhat arbitrary. The

enharmonic forms were evidently attracted by the Dorian enharmonic prototype. The Ionian enharmonic needs the **d** string tuned down to **B**, **CBB** being played on one string (v. p. 99).

to obtain one of their pivots by a scordatura, which was not necessary in the Syntonolydian ἀρμονία.

It is possible that by the fifth century this scordatura was made unnecessary by the addition of another string at the bottom of the  $\kappa\iota\theta\acute{a}\rho a$ . But my hypothesis of a basic system of eleven notes allows for the sixth-century  $\kappa\iota\theta\acute{a}\rho a$  of eight strings, pentatonically tuned, in which  $\bf C$  and  $\bf F$  were produced by stopping the  $\bf B$  and  $\bf E$  strings. That these  $\grave{a}\rho\mu\nu\iota\acute{a}\iota$  date back to the sixth century seems extremely probable, both from the fact that the Mixolydian must have existed for some time before Lamprocles, and from the presumption that the  $\grave{a}\rho\mu\nu\iota\acute{a}\iota$  had acquired conventional pitches by the time of Pratinas and Lasos. Lasos calls the Aeolian  $\grave{a}\rho\mu\nu\iota\acute{a}\iota$  ' $\beta a\rho\nu\iota$ - $\beta \rho o\mu os$ ': Pratinas places it between the High and the Low Ionian. Aristides omits the Aeolian, because Plato does not mention it; but we know that it was later completed as an A mode. Most probably it ran from  $\bf a$  down to the bottom  $\bf d$  of the  $\kappa\iota\theta\acute{a}\rho a$ : thus it would be  $\beta a\rho\iota\acute{b}\rho o\mu os$ , but still not so low as the Low Ionian, which went down to  $\bf C$ . Lasos may have been a tenor and Pratinas a baritone: but their statements do not conflict, as has been supposed.

There must, of course, have been a time when each musician had his instrument tuned to his native mode in the register best fitted to his voice. But by the end of the sixth century an inter-Hellenic musical convention had grown up. Barbarous elements and native folk-song alike had been transformed—doubtless with much distortion—into an educated Greek Kunstmusik. The  $\delta\rho\mu\nu\nu\ell\alpha\iota$ , as Lamprocles knew them, represent a highly artificial music, moulded into shape by Greek principles of tune-making, and adapted to the limitations of the Greek  $\kappa\iota\theta\delta\rho\alpha$  (which, like all ancient and sanctified instruments, was slow to accept innovations). These  $\delta\rho\mu\nu\nu\ell\alpha\iota$  bear the marks of composers rather than of theorists: they are the schemes or skeletons of songs actually sung, and have not yet been dissected and completed by scholars. But there is nothing primitive or foreign about them. Some of them are limited in range, for the songs were still austere and classical; but they had the consonances of the Greek scale and the melodic structure of the Greek composer. Such music need not have been ill-matched with the odes of Pindar and the choruses of Aeschylus.

## PART II

We can now perceive the relation between the  $\delta\rho\mu\nu\nu'i\alpha\iota$  and the later octave-species. The diatonic forms of the early  $\delta\rho\mu\nu\nu'i\alpha\iota$ , taken together, stretch from  $b^i$  to c; the enharmonic forms from  $b^i$  to c. Once the gaps at top and bottom of this compass are filled in by a tetrachordal analysis of the  $\delta\rho\mu\nu\nu'i\alpha\iota$ , a continuous 15-note diatonic scale will be obtained, and the  $\delta\rho\mu\nu\nu'i\alpha\iota$  will all become full species of the octave.

By the time of Aristophanes' Clouds (423 B.C.), as we have seen, the Mixolydian  $\dot{a}\rho\mu\nu\nu\dot{a}$  had been moved down an octave. When Lamprocles had filled in its upper tetrachord, the tessitura of the songs must have been found too high. So the high  $b^i$  disappeared, and when the 15-note scale of the Greater Perfect System was eventually formed, it was a scale  $a^i$ -A, instead of  $b^i$ -B. Either would have suited the Dorian system: it was the pitch that determined the choice.

On this new scale the άρμονίαι were completed and rearranged. We may perhaps attribute part of this work to Damon, who identified the Ionian άρμονία with the ἐπανειμένη Λυδιστί, and apparently completed it as an F mode. This is to be deduced

out of fashion in the earlier fifth century. Its name was afterwards given to an A mode, but the Aristoxenians used any handy obsolete name to christen their new scales.

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<sup>&</sup>lt;sup>I</sup> Cf. Sachs, Zeitschrift für Musikwissenschaft, vi (1923-4), p. 289.

<sup>&</sup>lt;sup>2</sup> One would have expected a ἀρμονία running from **g**<sup>1</sup> to **g**, as well as the Aeolian. This may perhaps have been the old Locrian, which went

The Lydian name, which had belonged to the old  $\delta\rho\mu\nu\nu$  i i, was now given to the C mode. The exchange of names between the Lydian and Ionian  $\delta\rho\mu\nu\nu$  is more apparent than real. Low Ionian corresponds to Low Lydian, High Ionian² probably corresponds to High Lydian. In fact, Ionian and Lydian music were the same—not unnaturally, since the Ionians lived in Lydia. There were no doubt some differences of melodic style and convention, but these must gradually have been merged when the  $\delta\rho\mu\nu\nu$  were schematized as octave-scales.

It is not, of course, to be thought that the older  $\delta\rho\mu\nu\nu'a\iota$  went suddenly out of use. Here, as in Lamprocles' case, theory did go before practice. The old names lingered on; the obsolescent terms  $\sigma\dot{\nu}\nu\tau\nu\nu\sigma$  and  $\dot{d}\nu\epsilon\iota\mu\dot{\epsilon}\nu\eta$  or  $\chi\alpha\lambda\alpha\rho\dot{\alpha}$  were still applied to the  $\dot{d}\rho\mu\nu\nu'a\iota$ , at least in amateur circles. Composers probably clung to the notes of a gapped scale in order to preserve the traditional  $\dot{\eta}\theta\sigma$ , even after it had been rounded off as an octave-species.

Plato lags far behind the professional theory of his time. He uses the old names of the  $\delta\rho\mu\nu\nu\ell\alpha\iota$ ; he refers to Damon; and he talks of the quarter-tones (which Euripides had used in 408 or earlier) as if they were a brand-new stunt. This need not astonish us. Old music dies hard; and many educated people to-day, if they speak of modern music, are really thinking of the innovations of Debussy rather than of Bartok.

How far had music developed by the beginning of the fourth century? To answer this question we must look at Heraclides Ponticus (fl. c. 390 B.C.).<sup>3</sup> I shall take some of his statements and ask upon what assumptions they become intelligible—if not intelligent. I transcribe the relevant passages:

- (1) Athen. 624 C. 'Ηρακλείδης δὲ ὁ Ποντικὸς ἐν τρίτῳ περὶ μουσικῆς οὐδ' ἀρμονίαν φησὶ δεῖν καλεῖσθαι τὴν φρύγιον, καθάπερ οὐδὲ τὴν λύδιον. άρμονίας γὰρ εἶναι τρεῖς· τρία γὰρ καὶ γένεσθαι Ἑλλήνων γένη, Δωριεῖς Αἰολεῖς Ἰωνας.
- (2) 625 Α. πρότερον μὲν οὖν, ὡς ἔφην, αἰολίδα αὐτὴν ἐκάλουν, ὕστερον δὲ ὑποδώριον, ὥσπερ ἔνιοί φασιν, ἐν τοῖς αὐλοῖς τετάχθαι νομίσαντες αὐτὴν ὑπὸ τὴν δώριον άρμονίαν. ἐμοὶ δὲ δοκεῖ ὁρῶντας αὐτοὺς τὸν ὄγκον . . . ἐν τοῖς τῆς άρμονίας ἤθεσι δώριον μὲν αὐτὴν οὐ νομίζειν, προσεμφερῆ δέ πως ἐκείνῃ.
- (3) 625 D. καταφρονητέον οὖν τῶν τὰς μὲν κατ' εἶδος διαφορὰς οὐ δυναμένων θεωρεῖν, ἐπακολουθούντων δὲ τῆ τῶν φθόγγων ὀξύτητι καὶ βαρύτητι,
- (4) καὶ τιθεμένων ὑπερμιξολύδιον άρμονίαν καὶ πάλιν ὑπὲρ ταύτης ἄλλην.
- (5) οὐχ ὁρῶ γὰρ οὕτε τὴν ὑπερφρύγιον ἴδιον ἔχουσαν ἦθος· καίτοι τινές φασιν ἄλλην ἐξευρηκέναι καινὴν ἀρμονίαν †ὑποφρύγιον†·
- (6) δει δὲ τὴν άρμονίαν είδος ἔχειν ἤθους ἢ πάθους,
- (7) καθάπερ ή λοκριστί. ταύτη γὰρ ἔνιοι τῶν γενομένων κατὰ Σιμωνίδην καὶ Πίνδαρον ἐχρήσαντό ποτε, καὶ πάλιν κατεφρονήθη.

§§ 3 and 6 tell us that a  $\delta\rho\mu\nu\nu\dot{\iota}a$  can be distinguished from other  $\delta\rho\mu\nu\nu\dot{\iota}a$  both by its pitch and by its  $\epsilon\dot{\iota}\delta\sigma$  or sequence of intervals—which is what we should expect from our previous conclusions—but that the latter is the correct or essential criterion. How, then, can Heraclides plausibly reduce the seven  $\delta\rho\mu\nu\nu\dot{\iota}a$  to three? Or rather,

- <sup>1</sup> Ps.-Plut. De Mus. 16; ap. Athen. 625 D.
- <sup>2</sup> Mentioned by Pratinas: v. supra, p. 99.
- <sup>3</sup> Mr. Winnington-Ingram (op. cit., p. 20, n. 3) suggests that Athenaeus himself, not Heraclides, wrote most of Athen. 624 C-625 F. But how

could Athenaeus be talking about new Hypermixolydian and Hyperphrygian  $\delta\rho\mu\nu\nu\iota\alpha\iota$ , at his date? The phrases  $\dot{\omega}s$   $\xi\phi\eta\nu$  and  $\dot{\omega}\sigma\pi\epsilon\rho$   $\dot{\epsilon}\xi$   $\dot{\epsilon}\rho\chi\hat{\eta}s$   $\epsilon\bar{\iota}\pi\nu\rho\mu\epsilon\nu$  show that he is quoting, as usual, in oratio recta.

to four; for he admits (§ 7) that the obsolete Locrian fulfilled the conditions of a true  $\delta\rho\mu\nu\nu la$ .

On the hypotheses I have already put forward Heraclides' argument can be explained. Following the initiative of Lamprocles, the ἀρμονίαι had become full octave-species and were analysed by tetrachords. This tetrachordal analysis is implied in Heraclides' use of the terms  $\dot{v}\pi\epsilon\rho$ - and  $\dot{v}\pi o$ - prefixed to the names of modes.<sup>1</sup> In Greek musical terminology,  $i\pi\epsilon\rho$ - denotes the mode pitched a fifth above (or a fourth below) the original mode to whose uncompounded name it is prefixed; while  $\delta \pi_0$ denotes the mode pitched a fifth below (or a fourth above) that original mode. Thus, if the Dorian mode is  $e^{i}-e$ , the Hyperdorian is  $b^{i}-b$  and the Hypodorian a-A. The reduction of the modes to four follows naturally from a consciousness of their component tetrachords. Only four modes have distinct and peculiar tetrachords: the other three repeat the same tetrachords, and are distinguished only by the position of the disjunction relatively to the ὑπάτη. Heraclides (§§ 4-6) is obsessed with the idea that ἀρμονίαι must be modally distinct; and he seems to be applying this principle to their tetrachords as well as to their complete octaves. His selection is, of course, arbitrary. He had no right to say that any three modes had a better title than their three related modes. But, on a tetrachordal analysis, he had a right to say: 'If I choose to select the E, A, and F modes, then the B, D, and C modes become superfluous.'2

I will next take § 5. This sentence demands the emendation  $\mathring{v}$ περφρύγιον for  $\mathring{v}$ ποφρύγιον: a very easy slip of the pen. No other reading will make sense after καίτοι. It would be nonsense to say: 'I can't see that the X mode has any  $\mathring{\eta}\theta_{OS}$  of its own either, and yet some people say they have discovered a new Y mode.'  $\mathring{v}$ περφρύγιον must be repeated.

The Hyperphrygian lay a fifth above the Phrygian mode  $\mathbf{d}^{l}-\mathbf{d}$ : i.e. the mode  $\mathbf{a}^{l}-\mathbf{a}$ . But there was already a mode  $\mathbf{a}-\mathbf{A}$ , the old Aeolian or Hypodorian (§ 2). Heraclides' point is that the two differ only in pitch, not in  $\epsilon l \delta_{0}$ . Here is more evidence of the new 15-note diatonic scale  $\mathbf{a}^{l}-\mathbf{A}$ , whose formation I have traced above. On this scale, the A mode could be repeated in two octaves.

So far, the music of Heraclides' day is only a development of the initiative of Lamprocles, logically worked out. But meanwhile, something new and exciting was happening. What was the so-called Hypermixolydian mode, and the other  $\hat{v}\pi\hat{\epsilon}\rho$   $\tau a\hat{v}\tau\eta s$ , of which Heraclides speaks (§ 4)? The Mixolydian, as we know, was the mode **b-B**. Tuning up a fifth from **b**, we reach **f**. Continuing on the white notes of the diatonic scale, we get the scale  $\mathbf{f}^{\dagger}\mathbf{p} = \mathbf{d}^{\dagger}\mathbf{c} \mathbf{b} \mathbf{a} \mathbf{g} \mathbf{f}^{\sharp}$ , which is simply the B mode transposed. Similarly, the other mode  $\hat{v}\pi\hat{\epsilon}\rho \tau a\hat{v}\tau\eta s$  begins on  $\mathbf{c}^{\sharp}$  and (keeping the  $\mathbf{f}^{\sharp}$ ) reproduces the B mode over again.

Heraclides merely growled that these three modes were all the same, except in pitch. But he had missed the point. Somebody had introduced the new notes  $\mathbf{F}_{+}^{\sharp}$  and  $\mathbf{C}_{+}^{\sharp}$  into the diatonic scale, and had thereby found a way of transposing modes from their traditional and natural registers. The idea of transposing modes was new. And this passage proves that it originated not through the  $\tau \acute{o}\nu os$ -mechanism of Aristoxenus but through the discovery of 'black notes'. These 'black notes' were superseded by the  $\tau \acute{o}\nu os$ -mechanism, because the latter was far more convenient if you did not want key-modulations in the manner of modern music: it enabled you

to recognize its tonality. Mr. J. D. Denniston (C.Q. vii, 1913, p. 85) has observed that  $\frac{\partial}{\partial u}$  and  $\frac{\partial u}{\partial v}$  implies a deliberate choice of pitch as the criterion of distinction between scales. Heraclides is attacking a new theory, not an ignorant confusion.

<sup>&</sup>lt;sup>I</sup> Cf. Appendix II (*infra*, p. 103) on the terms  $\dot{v}\pi\epsilon_{P}$  and  $\dot{v}\pi_{P}$ .

<sup>&</sup>lt;sup>2</sup> Cf. supra, p. 99, and n. 2 for identifications of these modes.

<sup>&</sup>lt;sup>3</sup> It is not necessary to suppose that all who miscalled the Hyperphrygian a 'new mode' failed

to transpose automatically instead of learning new scales on a chromatically constructed instrument.¹ Nevertheless, the 'black notes' were the first means of transposition. This is the answer to the old question: Why did Aristoxenus preserve (in the form of extra  $\tau \acute{o}\nu o\iota$ ) the 'black notes' which his  $\tau \acute{o}\nu os$ -mechanism had made superfluous? It was because they were real, known notes; they had dominated musical practice for two generations of transition, and had pointed the way towards the  $\tau \acute{o}\nu os$ -system. Aristoxenus, piously or pedantically, preserved the pioneers.

The discovery of the **F**# and **C**# is to be related to the invention of new instruments which could play all the ἀρμονίαι. Pronomus, Alcibiades' music-master, constructed an αὐλός of this kind;² and Plato mentions αὐλοί and harps which he calls παναρμόνια. Were they two-octave diatonic instruments, playing each mode in its natural register, or twelve-note instruments with a **B**b, playing four of the modes in their natural registers and the other three transposed? I think the latter. It was probably difficult to play two octaves on an ancient wind-instrument; and moreover, we should expect that **B**b was discovered before **F**# and **C**#. The παναρμόνια therefore belong to the experiments in transposition which we find reflected in Heraclides Ponticus.

It need not surprise us to find so many Aristoxenian ideas already current about 400 B.C.<sup>3</sup> On the contrary, it would be surprising if this were not so. The åρμονίαι which were gapped or incomplete in Lamprocles' day are found neatly and symmetrically worked out by the time of Heraclides: the experiments in transposition which are new, fragmentary, and uncodified in Heraclides' day will be found reduced to a logical system by the time of Aristoxenus. Practice goes before theory, music before scales. The creative ferment—as the historian would expect—lasted down to the death of Plato. Then, when it had subsided, it was time for Aristotle's pupil to reduce the chaotic practice to the methodical system, and to grasp its essential features with his formidable common sense.

The effect of the discovery of key-transposition was, naturally, to reduce the early variety of modes to one predominant scale: the Dorian. In this period—which was also a period of musical theory and scholarship—the old relative names of the notes were fixed absolutely to the notes of the Dorian system. That this naming should have been called the ἐνομασία κατὰ δύναμιν—'by function'—shows how complete was the ascendancy of the Dorian mode. About the time of Ptolemy, or not much earlier, the modes revived. They had a long and magnificent history, but in the end they succumbed again to the new sharps and flats, the new experiments in transposition, which were to dominate our own classical music. Renascence composers repeated, in principle, the revolution which overcame Greek music in the fourth century B.C.

#### APPENDIX I

#### The Spondeion and Enharmonic Scales

Ps.-Plutarch, *De Musica* 11, quoting Aristoxenus, describes how 'Olympus' invented the Spondeion and Enharmonic Scales. He calls the Spondeion the first of Olympus' enharmonic compositions, but distinguishes it from the regular enharmonic scale by saying that it did not touch the typical intervals of this scale (nor of the diatonic and chromatic scales either). He says Olympus constructed

¹ The τόνος-mechanism, like a capo tasto, transposed the entire instrument, which thus dispensed with 'black notes'. But I suspect that Timotheus' lyre (c. 380 B.C.) was built chromatically. Sachs' interpretation of Athen. 637 E-F (in History of Mus. Instruments, p. 131) is most unlikely. The addition of C and F strings to a pentatonically tuned lyre would not have been revolutionary, since these notes had long been

used (as stopped notes on the B and E strings); and I do not see how it would have facilitated modulation, as he suggests.

- <sup>2</sup> Athenaeus, 631 E; Pausanias, ix. 12; Plato, *Republic*, 399 C-D.
- <sup>3</sup> There is no sharp division between the usage of the two terms  $\delta\rho\mu\nu\nu la$  and  $\epsilon l\delta os$   $\tau o\hat{\nu}$   $\delta\iota\dot{a}$   $\pi a\sigma\hat{\omega}\nu$ . The  $\delta\rho\mu\nu\nu la$  of Heraclides have already evolved into octave-species.

it from the notes **F**, **A**, and **B**, by passing to the  $\pi a \rho \nu \pi \acute{a} \tau \eta$  from the  $\mu \acute{e} \sigma \eta$  or the  $\pi a \rho a \mu \acute{e} \sigma \eta$ . These progressions do, in fact, avoid the typical perfect fourth and fifth, and substitute a major third and augmented fourth, **F**-**A** and **F**-**B**. To add **E** below **FAB**, as most scholars do, is to produce the very intervals which the Spondeion is said to have avoided.

Moreover, the term  $\sigma \pi o \nu \delta \epsilon \iota a \sigma \mu \delta s$  must have been invented to correspond to the metric form -. Since metric syllables are counted from the ictus, they must be expressed by notes, not by tones (two ditones would represent the foot - -  $\circ$ , not the foot - -). An augmented fourth **F-B**, divided at **A**, expressed the form of the spondee.

After inventing the Spondeion, Olympus composed in it ἐπὶ τοῦ Δωρίου τόνου: in the Dorian register. Ps.-Plutarch then mentions, as characteristic of the Old Enharmonic music, τὸ ἐν ταῖς μέσαις ἡμιτόνιον; i.e. the semitone **E-F**. This shows that the Spondeion was adapted to the Dorian τόνος by adding the Dorian final **E**. The Old Enharmonic scale is thus **BAFE** (read downwards).

After Olympus' time (it is stated) the semitone was divided. (This produced the Enharmonic sequence **B A FEE**).

This account shows clearly that the enharmonic genus was originally an adaptation of the Spondeion to the Dorian  $\tau \acute{o} ros$  only. In no other mode would the progressions described be so placed as to cheat the ear of the perfect fourth or fifth from  $\mu \acute{e} \sigma \eta$  or  $\pi a \rho a \mu \acute{e} \sigma \eta$ , which the Greek expected in his tunes.

Ps.-Plutarch knew a scale which had an upper  $\sigma\pi\sigma\nu\delta\epsilon\iota\alpha\sigma\mu\delta$ s as well as a lower. It is true that the term  $\sigma\pi\sigma\nu\delta\epsilon\iota\alpha\sigma\mu\delta$ s afterwards became associated with the rise of a  $\frac{3}{4}$  tone. But that this was its original meaning is philologically incomprehensible. If we take the  $\sigma\pi\sigma\nu\delta\epsilon\iota\alpha\sigma\mu\delta$ s to mean the whole sequence **FAB**, the addition of an upper  $\sigma\pi\sigma\nu\delta\epsilon\iota\alpha\sigma\mu\delta$ s would make a scale **FABD** $\sharp$ **F**<sup>1</sup>. But, says Ps.-Plutarch, the top tone was a quarter tone less than the tone **AB**. The scale would therefore be **FABD** $\sharp$ **E**. This, he explains, avoids a diatonic interval (viz. the octave interval **F**-**F**<sup>1</sup>) and also avoids the juxtaposition of a  $\delta\iota\tau\sigma\nu\sigma$ s  $\sigma\iota\tau\theta\epsilon\tau\sigma$ s and a  $\delta\iota\tau\sigma\nu\sigma$ s  $\sigma\iota\tau\theta\epsilon\tau\sigma$ s (viz. **B**-**D** $\sharp$  and **AB** + **D** $\sharp$ **F**).

The reconstruction of the complete Spondeion scale as **EF ABŪ** (Winnington-Ingram, C.Q. xxii, 1928) seems to me to read far too much subtlety into Ps.-Plutarch's statements about intervals. He is referring to the main divisions of the scale, not to small differences between tones.

#### APPENDIX II

### The Use of $i\pi\epsilon\rho$ - and $i\pi\epsilon$ -

Mr. Winnington-Ingram (op. cit., p. 20) has suggested that in Heraclides' day ὁπερ and ὁπο did not always indicate a tetrachordal relation between modes. Two arguments deserve notice: (1) Heraclides in § 2 seems ignorant of the real relation of Hypodorian to Dorian. But here, I believe, he is disingenuously concealing this relation, because he wanted both modes in his chosen group of three, and therefore had to pair off the B mode, instead of the A mode, with the E mode. As the triadic grouping was new and imperfectly grasped, he could get away with his arbitrary selection. (2) In the Aristoxenian system, the name Hypermixolydian corresponds to the mode a-A: i.e. ὑπερ- was used vaguely in this case (cf. the term ὑπερυπάτη). But (a) Heraclides cannot mean an A mode by his Hypermixolydian. Mr. Winnington-Ingram's interpretation of §§ 4–5 makes neither Greek nor logic: the οὖτε shows that the Hypermixolydian and Hyperphrygian are different modes, while the καίτοι makes the MS. reading ὑποφρύγιον nonsensical. (b) The Aristoxenians did use obsolete modal names arbitrarily for their superfluous τόνοι and the relative modes (of which the a-A mode is one)—cf. supra, p. 99, n. 2. Their Hypermixolydian must be another, though an odd, instance.

If Heraclides is using  $\delta \pi \epsilon \rho$ - in the usual technical sense, his argument becomes clear. The two A modes have the same  $\epsilon l \delta o s$ : so have the three modes on **B**, **F**#, and **C**#. In reducing the modes to four, he pursues the same idea: tetrachords, as well as octaves, must have a distinct  $\epsilon l \delta o s$ . (I agree with Mr. Winnington-Ingram that  $\delta \rho \mu o \nu i a \iota$  were not originally analysed by tetrachords, but this analysis was certainly discovered by Lamprocles).

Heraclides' Hypodorian is the old  $\beta \alpha \rho \nu \beta \rho \rho \mu \rho \sigma$  Aeolian mode **a-A**, not the later Hypodorian **a'-a**. The application of  $\delta \pi \epsilon \rho$ - and  $\delta \pi \sigma$ - to the  $\tau \delta \nu \sigma \sigma$  had the natural result of reversing the pitch-order of its application to the modes.

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The 'System' in Greek Music.: A Suggestion

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# ARCHAEOLOGY.

### THE 'SYSTEM' IN GREEK MUSIC.— A SUGGESTION.

In his Modes of Ancient Greek Music, p. 139, Mr. Monro, speaking of the music found at Delphi in 1893, says, 'The general impression made by the diatonic parts of the melody is that of the key of C minor.' This is quite true: but it is the modern socalled 'harmonic' C minor scale; and this agrees with no 'mode' described by the ancients, or by mediaeval theorists.

I venture to think that the long description of the 'system' given by Aristides Quintilianus (Meibom), p. 15, 16, 17, read in conjunction with a careful analysis of the Delphic 'Hymn to Apollo,' will show that in classical times and probably later the system, and not only the mode (or octave), regulated the melody: while Mr. Monro's contention (p. 5), that the passages on which the usually accepted theory is based... 'point to the emergence in post-classical times of some new forms or tendencies of musical art,' is strongly supported by a similar analysis of the well-known 'Hymns of the Antonines,' and the Tralles hymn.

I propose therefore to quote the various

'systems' on which I consider that the 'Hymn to Apollo' is built, and to apply to each the words of Aristides. I must first, however, explain some of the technical terms, which are probably unfamiliar to many of my readers.

The complete scale or τρόπος is constructed of a series of tetrachords: and in the chromatic and enharmonic genera, each sound has not only a name referring to its place in the scale, but also another name referring to its place in the tetrachord.

It will be convenient for my present purpose to use chiefly the latter nomenclature. The chromatic and enharmonic tetrachord consisted of a group of three sounds in succession close to one another, called the πυκνόν, and of a fourth sound at the interval of a perfect fourth above the lowest sound of the pycnon. The lowest sound of the pycnon was called βαρύπυκνος, the middle μεσόπυκνος, the upper ὀξύπυκνος. The highest note of the tetrachord, if it formed part of the next tetrachord, was called βαρύπυκνος, but if it formed the concluding note of a scale, was ἄπυκνος. The names of the individual sounds in each of my examples are shown by the letters  $\beta$ ,  $\mu$ , o, a,

Tetr. Meson Tetr. Synemmenon Т M M Λ K 20 0 β β β  $\mu$ 

e.g. Phrygian chromatic trope.

The 'Hymn to Apollo' makes use of no complete scale or 'harmony': and although its musical characters for the most part belong to the Phrygian trope, yet they do not occur in scale order, while two of the signs are foreign to the Phrygian notation. But the melody appears to me to be founded on various small 'systems' such as are described by Aristides in the following extract, of which I offer a translation by Mr. A. W. Gundry, M.A., of Bradfield College, and myself.

Σύστημα δέ έστι, τὸ ὑπὸ πλειόνων ἡ δυοίν διαστημάτων περιεχόμενον. των δε συστημάτων διαφοραί, αἱ μὲν δμοιαι ταῖς ἐπὶ τῶν διαστημάτων είρημέναις · αί δὲ πλείους, ώς αίδε. τὰ μὲν αὐτῶν ἐστι συνεχή, ὡς τὰ διὰ τῶν έξης φθόγγων τὰ δ' ὑπερβατὰ, ὡς τὰ διὰ τῶν μὴ έφεξης μελωδούμενα.

A system is that which is contained by several, or (only) two intervals. But there are differences of systems, some of which are like those differences we enumerated

<sup>1</sup> The more natural translation would be 'A system is that which is contained by more than two intervals.' The passage is, however, corrupt, see Meibom, Notae, p. 225. Aristoxenus says, p. 15, το δε σύστημα σύνθετον τι νοητέον εκ πλειόνων ή ένδς διαστημάτων. One must conceive a system as being compounded of more than one interval. This is confirmed by Pseudo-Euclid, p. 1, and by Gaudentius, p. 5, who says άπλῶς γὰρ σύστημά ἐστι τὸ ἐκ πλειόνων ἡ ἐνὸς διαστημάτων συγκείμενον διάστημα. Bacchius senior moreover, p. 2, says that a system must have more than two sounds (i.e. more than one interval). It seems pretty clear therefore that the smallest system had three sounds and two intervals. Westphal, Aristoxenus, p. 234, remarks: 'Also c, d, e, f, g, aber auch schon c, d, e, f, oder c, d, e, würden ein System sein.'

in connection with the intervals; but the majority (of differences) are as follows: some systems are continuous, the sounds being placed

in consecutive order: others are irregular, in which the melody does not proceed by consecutive sounds.

Ex. 1a. Phrygian chromatic trope. System of four consecutive sounds.



Here the sounds are placed in consecutive order, the interval K  $\Gamma$  being a simple interval according to Greek theory, as no sound occurs between these notes in the chromatic genus.<sup>2</sup> The following passages in the 'Hymns' appear to be founded on this system.

Ex. 1b.



Ex. 1c.

Ex. 2e.



2. Systems of three sounds 2 (two intervals).



It will be observed that all the systems in Ex. 2 are composed of the succession mesopycnos, barypycnos, mesopycnos, the oxypycnos (or lichanos) being in each case omitted. Hence I believe myself justified in assuming that these three examples are 'irregular systems in which the melody does not proceed by consecutive sounds.' Pseudo-Euclid, p. 14, calls systems which are contained between mesopycna 'the second species of diatessaron.'

The following passages seem to be founded on Ex. 2a, b, c. Ex. 2d.



<sup>1</sup> See Aristides, p. 13, Pseudo-Euclid, p. 12, gives four differences of system as common with those of intervals, viz. difference of magnitude, of genus, of consonance and dissonance, of rational and irrational. Aristoxenus, p. 74, speaks of 'species' and 'scheme'

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as two names referring to the same thing, viz. the arrangement of the intervals in a system. Unfortunately his description of the systems is lost.

<sup>2</sup> το τριημιτόνιον έν μέν χρώματι ἀσύνεθτον, Pseudo-Euclid, p. 9. Ex. 2b is exactly an octave above Ex. 2a, and it is significant that the quotation 2e immediately follows 2d in the original. It would appear possible then that the Greeks, instead of repeating a melody at an octave higher than where it first occurs, as with us, repeated a *system* an octave higher: but one example is insufficient to do more than suggest without proving this point.<sup>1</sup>

Ex. 2f.



The note B occurs only once; and the melody immediately after Ex. 2f goes into system 1a.

Ex. 3a. System of four sounds, not in consecutive order (pentachord).

Phrygian.



Here, again, there is no oxypenos, the *lichanos Meson* being omitted, and I being the lowest note of the disjunct tetrachord.

Φοι-οι - βον ωι - δαεισι μελ-ψητε

This long passage is carefully confined to the limits of  $\Upsilon$  and  $\Theta$ : it is followed by system 2a, 2b, after which the melody returns to system 3a for four bars.

Aristides continues:-

καὶ τὰ μὲν ἀπλᾶ καθ' ἔνα τρόπον ἔκκειται τὰ δὲ οὐχ ἁπλᾶ, ἃ κατὰ πλειόνων τρόπων πλοκὴν  $\gamma$ ίνεται.

And some are simple, since they are set forth in one key; others are not simple, since they arise out of the combination of several keys.

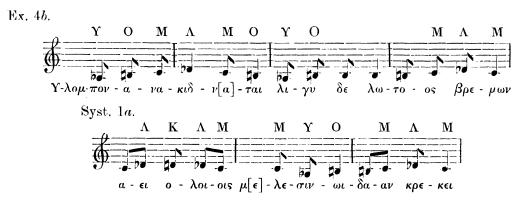
All the examples I have given hitherto are simple, since they are each contained in one key. I think the following example is 'not simple' since it can be referred to no one key.

Ex. 4a.



Here again there is no oxypycnos.

<sup>&</sup>lt;sup>1</sup> A change from one system to another is called 'metabole' of system, and the frequent allusions to it show that it must have played an important part in composition.



η τῷ τὰ μὲν εἶναι συνημμένα, τὰ δὲ διεζευγμένα, τὰ δὲ κοινά. καὶ συνημμένα μέν ἐστιν, ὧν εἶς φθόγγος γίνεται κοινός. ἃ καὶ κατ᾽ ἄλληλα λέγεται. διεζευγμένα δὲ, ὧν εῗς φθόγγος μέσος ἐμπίπτει, χωρίζων ἐκάτερον. ἃ καὶ παράλληλα καλεῖται, κοινὰ δὲ. τὰ ποτὲ μὲν κατὰ συναφήν· ποτὲ δὲ κατὰ διάζευξιν κείμενα.

Moreover some are conjunct, others disjunct and others common. And conjunct systems are those which have one of their sounds in common. These are also called reciprocal systems. But disjunct systems are those in which one sound occurs between them, separating the systems. These are also called parallel systems. And common systems are sometimes conjunct sometimes disjunct.

In the complete trope of two octaves, the two highest tetrachords belong only to the 'greater perfect' or 'disjunct' system, the conjunct tetrachord to the 'lesser perfect' or conjunct system, while the two lowest tetrachords are common to both systems. I think the passage is also applicable to my examples. Thus Ex. 1a belongs entirely to the conjunct or lesser perfect system, Ex. 2a, b, to the disjunct or greater perfect, 2c is common to both; Ex. 3a is disjunct, while Ex. 4a is common.

ἔτι τῶν συστημάτων ἃ μέν ἐστι τετράχορδα, ἃ ὑπὸ τεσσάρων φθόγγων κατὰ φύσιν κειμένων περιέχεται ἃ δὲ πεντάχορδα ἃ δὲ ὀκτάχορδα. τὸν δ᾽ αὐτὸν ὄρον κἀπὶ τούτων νοητέον.

Moreover, of the systems, some are tetrachords, which are contained by four sounds placed in the natural order: others are pentachords, others octachords. And we must understand the same description as applying also to these.

Aristides here mentions tetrachords, pentachords and octachords as 'systems.' He omits the 'greater perfect' and 'lesser perfect' systems. Aristoxenus, p. 6, complains that Erastocles only describes the octave systems, whereas there are many others

<sup>1</sup> Pseudo-Euclid in the parallel passage, p. 17, uses the word  $\tau \delta \nu os$ , which makes the sentence far more intelligible.

See Ptolemy, Harmonics, Book ii. ch. 4.

Pseudo-Euclid, p. 12, mentions the tritone (e.g. f, g, a, b), diapason, diapente, and diatessaron as different systems, and says that systems can be consonant or dissonant, according to whether their boundary sounds are consonant or dissonant. Thus the tritone will be a dissonant system. Again on p. 13 he says that dissonant systems are all those which are smaller than a diatessaron, and those which come between the several consonant systems.

It seems clear then that practically any combination of three or more sounds in scale order could be a system: but that the consonant systems of the 4th, 5th, octave, octave and 4th, and double octave, being the most important, are, as a rule, the only ones described in detail by Greek theorists.

With regard to the systems of three sounds, Ex. 2 formed by the omission of the oxypycnos, it would seem that in classical times musicians were in the habit of omitting notes in this way: for Plutarch tells us (Westphal's ed. p. 13, 14) that Olympus and Terpander, and those who imitated their style, omitted the notes  $\tau \rho i \tau \eta$  and  $\nu \eta \tau \eta^3$  as unsuitable to the  $\tau \rho i \sigma \sigma s \sigma \tau \nu \tau \delta \epsilon \iota a \kappa \delta s$ , although they used them in the instrumental accompaniment. It is only reasonable to conclude therefore that in other forms of compositions certain notes might be omitted, as in Ex. 2a, b, c, Ex. 3a.

Τούτων τὰ μέν ἐστι σύμφωνα· τὰ δὲ διάφωνα. σύμφωνα μὲν οὖν ἐστι τετράχορδα, τὰ ὑπὸ συμφώνων φθόγγων περιεχόμενα, πεντάχορδά τε καὶ ὀκτάχορδα. ἀσύμφωνα δὲ, τὰ μὴ οὖτως ἔχοντα.

<sup>3</sup> It is evident from the context that only trite and nete diezeugmenon are referred to. In the Phrygian chromatic trope these notes would be respectively



τίς δὲ ἡ φθόγγων συμφωνία, προειρήκαμεν. γίνεται δὲ αὐτῶν ἡ ἔκθεσις ἐξ ἀνομοίων διαστημάτων, οἷον διέσεων, ἡμιτονίου, τόνου.

Some of these are consonant, the others dissonant. Consonant systems are tetrachords, which are contained between consonant sounds, also pentachords and octachords. Dissonant systems are those which are not thus formed. And what consonance of sounds is, we have already explained. Their exposition is by dissimilar intervals such as diesis, semitone, tone

I have already discussed dissonant and consonant systems, when referring to Pseudo-Euclid. I have found no dissonant system in the Delphic hymns.

ἔστι δὲ αὐτῶν καὶ ἡ κατ' εἶδος διαφορά · τὰ μὲν ὑπὸ ἔστώτων, τὰ δὲ ὑπὸ φερομένων φθόγγων περιέχεται.

There are also differences of species. Some are bounded by fixed, others by movable sounds.

The differences of octave species have formed the foundation of the whole mediaeval theory of Gregorian modes. But in classical times it would seem that the fourth and fifth and perhaps other systems had their difference of species. As Aristides says more about this later on I will leave its further discussion until I come to the passage in question.

Some are bounded by fixed, others by movable sounds. Ex. 1a is bounded by the fixed sounds Mese and Nete synemmenon. Exs. 2a, b, c, 3a, 4a, are all bounded by mesopycna, the lower movable sound.

καὶ ἃ μὲν αὐτῶν ἐστι τέλεια· ἃ δὲ οὖ· ἀτελῆ μὲν, τετράχορδον, πεντάχορδον· τέλειον δὲ, ὀκτάχορδον· ἐπεὶ πᾶς ὁ μετ' αὐτὸν φθόγγος ὅμοιός ἐστι πάντως ἔνὶ τῶν προηγησαμένων.

And some of them are perfect, others not. Perfect is the octave, since each subsequent sound is altogether like one of those which go before.<sup>1</sup>

This is a reference to the scale-systems pure and simple.

τὸ μὲν οὖν τετράχορδον καλεῖται διὰ τεσσάρων' συνέστηκε δὲ ἐκ τόνων δύο καὶ ἡμιτονίου. ἡμιτονιών ε΄. διέσεων ι΄. τὸ δὲ πεντάχορδον καλεῖται μὲν διὰ πέντε: σύγκειται δὲ ἐκ τόνων τριῶν ἡμίσεος. ἡμιτονίων ζ. διέσεων ῖδ. τὸ δὲ δι' ὀκτὼ καλεῖται μὲν διὰ πασῶν διατίθεται δὲ ἐκ τόνων ς. ἡμιτονίων ιβ. διέσεων κδ.

The tetrachord is called diatessaron. It consists of two tones and a semitone: or five semitones, or ten dieses. The pentachord is called diapente. It contains three and a half

tones; seven semitones or fourteen dieses. But the diaocto system is called diapason, and consists of six tones, twelve semitones, twenty-four dieses.

This is of course according to the Aristoxenian division, as devised for the practical purposes of musical art. The Pythagoreans did not accept this rough and ready division, but expounded a mathematical theory of the scale which was utterly inadequate for high developments of the art of music.<sup>2</sup>

ἔτι τῶν ὅλων συστημάτων ἃ μέν ἐστι πυκνά,ἃ δὲ ἀραιά.

Moreover, of all systems, some are condensed, others extended.

The enharmonic and chromatic tetrachords are condensed systems, the diatonic extended.

καὶ τὰ μὲν ἀμετάβολα τὰ μίαν ἔχοντα μέσην τὰ δὲ μεταβαλλόμενα, τὰ πλείους ἔχοντα μέσας.

And some are without modulation, having only one mese: others are modulatory, having several meses.

Mese appears to have held as important a place in Greek music as the modern keynote. Aristotle, in his nineteenth problem, informs us that in songs which are well composed the mese is often used: and that composers if they go far from that note promptly return to it. The mese of Exs. 1a, 2a, b, 3a is M, and we find in the best preserved of the Delphic fragments that this note largely preponderates over all the others, being used 48 times in the 213 notes. The next below this in number is the Hyperphrygian mese  $\Gamma$ , which occurs 25 times.

Ex. 4a would appear to be a system 'having several meses' (i.e. more than one). It seems to belong partly to the Phrygian and partly to the Dorian trope: but a difficulty, which in our present state of

<sup>2</sup> The Pythagoreans and Aristoxenians were the ancient representatives of two opposing sects of musicians, which continued all through the middle ages, exist now, and always will exist. The question between them is not in reality what is the truth in musical matters, but what is most congenial to the individual temperament and brain-power of each musician. Music has its mathematical and its emotional side: and each individual will incline to the Pythagorean, the scientific side, or the Aristoxenian, the artistic, emotional, empirical side, according to his temperament. The scientific and empirical elements find their natural meeting-ground in instruments of fixed pitch, such as the organ and piano, in the tuning of which a compromise has to be effected between mathematical precision and empiricism. Our Universities now demand of candidates for Musical Degrees a knowledge of the chief features of both these opposing sides of music; but the double knowledge is not naturally cultivated by the same individual.

<sup>1</sup> I.e. the sounds of the upper octave severally coincide with those of the lower octave.

knowledge cannot be explained, arises from the fact that the Dorian mese II does not occur in the Hymns.

καὶ τὰ μὲν διὰ τῶν έξης φθόγγων· τὰ δὲ δι' ὑπερβατῶν μελωδεῖται.

And some are sung by successive sounds: others by sounds which are not successive. That is to say, some systems are composed of sounds in scale order, others of sounds not in scale order. The first kind of system seems to occur in Ex. 1a, 2a, b, c, the second in Ex. 3a, 4a.

σχήματα δ' αὐτῶν ποικίλα ἀπὸ τῆς τῶν διαστημάτων ἡγεμονίας, ἢ ποίας τάξεως θεωρούμενα. ἢ πρῶτόν ἐστιν ἡμιτόνιον, ἢ δεύτερον, ἢ τρίτον, ἢ ὁποστονοῦν.

And the schemes of the systems vary, according to the disposition of the intervals, or being considered as to their arrangement. For either the first interval is a semitone, or the second, or the third, or one of them. Instances of each will be found in my examples.

τετράχορδα μεν οὖν ἐν ἐκάστῳ τόνῳ τυγχάνει κατά διαίρεσιν θεωρούμενα έ · ύπατων, μέσων, διεζευγμένων, συνημμένων, ύπερβολαίων. πεντάχορδα δε σύμφωνα τρία · μέσων, συνημμένων, διεζευγμένων. ὀκτάχορδα δε δύο · συνημμένων τε καὶ διεζευγμένων. εἴδη δὲ αὐτῶν πλείονα, καθ' εκάστου φθόγγου παραύξησιν λαμβανόμενα. παρὰ μέντοι τοῖς παλαιοῖς τὸ μεν δια τεσσάρων εκαλείτο συλλαβή. το δε διὰ πέντε, διοξεία. τὸ δὲ διὰ πασῶν, ἄρμονία. δ καὶ ποικίλων κατ' εἶδος ὀνομάτων τετυχήκει. τὸ μὲν γὰρ ἀπὸ ὑπάτης ὑπατῶν ἐκαλεῖτο μιξολύδιον. τὸ δὲ ἀπὸ παρυπάτης, λύδιον. τὸ δὲ ἀπὸ διατόνου, φρύγιον. τὸ δ' ἀπὸ μέσων ύπάτης, δώριον. τὸ δὲ ἀπὸ παρυπάτης, ὑπολύδιον. τὸ δὲ ἀπὸ διατόνου, ὑποφρύγιον. τὸ δ' άπὸ μέσης, ὑποδώριον. ἐκ δὴ τούτου φανερὸν, ώς καὶ ταὐτὸν ὑποθεμένοις σημεῖον πρῶτον, άλλοτε άλλη δυνάμει φθόγγου κατονομαζόμενον, έκ της των έφεξης φθόγγων ακολουθίας την της άρμονίας ποιότητα φανεράν γενέσθαι συμβαίνει. περί μεν οὖν συστημάτων, ἃ καὶ ἀρχὰς οἱ παλαιοὶ τῶν ἠθῶν ἐκάλουν, ἀρκείτω ταῦτα.

In each key the tetrachords occur to the number of five, considered according to the (proper) division: viz. (the tetrachord) of the hypates, the meses, the conjuncts, the disjuncts, the hyperbolaia. There are three consonant pentachords, viz. of the meses, the conjuncts and disjuncts. Two octachords, conjunct and disjunct. And the species of these systems are various, according to how they are built

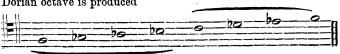
up from each (commencing) sound. The ancients called the diatessaron syllable, the diapente dioxeia, and the diapason harmony: and names were given (to the last) according to the species. That commencing on hypate hypaton (B, in modern notation) was called Mixolydian: that on parypate (C) Lydian; that on diatonos (D) Phrygian; that on hypate meson (E) Dorian; that on parypate (Meson) (F) Hypolydian; that on diatonos (Meson) (G) Hypophrygian; that on Mese, (A) Hypodorian.

From this it is manifest how, if the same note is used and called by different names (in several harmonies) according to its power with regard to the commencing note, the sequence of sounds placed in order will make the quality of the harmony manifest. This is sufficient concerning the systems, which the ancients also called principles of character.

I think it is not going too far if we imagine that Aristides and other writers consider the octaves commencing on the various notes of the fundamental scales merely as models of those which arise in one particular octave (F to F) by the application of the various tonoi. By adding to the octave F to F the flats proper to the various tonoi, it will be found that all the 'harmonies' described above are to be produced in this one octave: 1 and it seems very possible that the strings of the lyre, while keeping within the octave FF, were variously tuned according to the requirements of each particular tonos. important question however cannot be discussed here.

My object in this paper is to suggest that not only the harmony or octave species, but the various forms of tetrachord, pentachord, etc., were, in classical times, used as the basis of musical compositions: and that in later times the octave became the sole system used for this purpose, as we know was the case in Gregorian music. The three Hymns of the Antonines are all in the Lydian tonos; and their relationship to the octave species is as follows: the Hymn to the Muse is contained in the compass EFGAB, CDEF, that is, the Lydian octave plus one note below; the Hymn to Helios is in the Lydian octave (F to F), the Hymn to Nemesis in the Lydian octave plus one note (G) above. I think then that Mr.

<sup>1</sup> E.g. to the octave F to F (white keys of the piano) add the five flats proper to the Dorian key (B flat minor) and the Dorian octave is produced



Monro's suggestion of the 'emergence in post-classical times of some new forms or tendencies of music' is quite justified if these new forms and tendencies are taken to be the reduction of the number of systems used in composition to that of the octave, to the exclusion of 4ths, 5ths, etc.

Musicians have always required definite melodic models on which to base their compositions; just as a poet requires to keep his ideas within definite limits, an orator to keep to his subject, an architect to his plans. Thus, the Southern Indians have from time immemorial based their melodies on 'ragas,' the raga being a kind of formula which is more or less closely adhered to throughout the melody: 1 the composers of Gregorian music worked within definite limits round a 'dominant': the early contrapuntists based their works on Gregorian melodies, or secular songs: the Elizabethan instrumental composers wrote endless variations on short tunes: the fugue is definitely based on a subject of a few notes. The simplest ballad repeats one tune many times according to the number of stanzas: and every great composer has been obliged to base his larger instrumental works on a few short well-defined subjects. The modern rules as to tonality in composition arise from the same necessity of a clear and definite scheme upon which to work: and I cannot help thinking that the 'system' may have played much the same part in Greek music as the various means I have just mentioned in the music of other races and ages for the attainment of definiteness and conciseness.

Since the above was written I have, through the courtesy of MM. H. Weil and T. Reinach, been able to see the latest Hymn found at Delphi. It is unfortunately in a far more dilapidated condition than the specimens found in 1893; but such short pieces of consecutive melody as it has been possible to translate (scarcely 3 bars without a break) seem to be founded on the same basis as I have endeavoured to suggest, i.e. short portions within more or less well-defined limits which possibly form 'systems' of various kinds: and the systems are not necessarily octaves or 'modes.'

C. F. ABDY WILLIAMS.

<sup>1</sup> See Day's Music of Southern India.

# THE CENTRAL GROUP OF THE EAST FRIEZE OF THE PARTHENON PEPLOS OR στρωμνή?

I AM glad that my paper in the Classical Review has called forth an interesting rejoinder from Dr. Furtwängler (June 1895, p. 269). Professor Curtius's theory, which it surprised me that he left unnoted in the English edition of his book, he now discusses in full. I have carefully weighed Dr. Furtwängler's arguments, but still remain unconvinced. The point at issue is this. Dr. Furtwängler states that in the Magnesia inscription the στρωμναί must be taken as complete 'Lectisternia'—not, as Curtius takes them, as carpets; στρωμνή he holds must mean a couch, never a carpet. He goes further; the στιβάδες of the inscriptions also means couches, not things strewn on the ground; carpets for floors have no place in Greek culture, because the Greeks were not in the habit of sitting or reclining on the ground. This surprises me. The primary meaning of στιβάς is surely a collection of leaves, boughs or rushes, whether strewn loose or packed together as a bed: like many another word it took on other connotations with advancing civilization, but down to New Testament days it kept its primary sense, as is clearly seen in S. Mark xi. 8 πολλοὶ δὲ τὰ ἱμάτια αὐτῶν ἔστρωσαν εἰς τὴν ὁδόν, ἄλλοι δὲ στοιβάδας ἔκοπτον ἐκ τῶν δένδρων καὶ έστρώννυον είς την όδόν.

In the Iobacchoi inscription (Athen. Mitt. xix. 248, mention is made of the feast of the στιβάs, and Dr. Wide comments as follows, p. 272, Στιβάς ist eigentlich dasselbe wie Streu oder ein einfaches Lager von Blättern, Schill und dgl. In dieser Bedeutung wird es in Kriegesschilderungen (Aristoph. Frieden, 348, Xen. Hell. vii. 1, 16, Polyb. v. 48, 4) gebraucht so wie in der Beschreibung gewisser Feste wo die Theilnehmer auf solchen στιβάδες lagerten (Aristoph. Plutos 663, Athen. iv. 138 f. 140 f.). The account of a 'κοπίς' in Athenaeus is instructive. 'Ἐπὴν δὲ κοπίζωσι πρῶτον μὲν δή σκηνάς ποιοῦνται παρά τὸν θεὸν, ἐν δὲ ταύταις στιβάδας έξ ύλης έπὶ δὲ τούτων δάπιδας ύποστρωνύουσιν, έφ αίς τοὺς κατακλιθέντας εὐωχοῦσιν. Similarly at a feast of Dionysos in the Kerameikos (Philostr. Vit. Soph. ii. 3) citizens and strangers alike were feasted lying upon στιβάδες of ivy (ἀστοὺς ὁμοίως καὶ ξένους κατακειμένους ἐπὶ στιβάδων κίττου). In commenting on this same Iobacchoi inscription, Professor Ernst Maass (Orpheus p. 53) says pertinently, 'Und nun gewinnt



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## XX. The Hendecachord of Ion of Chios

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Ένδεκάχορδε λύρα, δεκαβάμονα τάξιν ἔχουσα τὰς συμφωνούσας άρμονίας τριόδους: πρὶν μέν σ' ἐπτάτονον ψάλλον δὶς τέσσαρα πάντες Ελληνες σπανίαν μοῦσαν ἀειράμενοι.

This fragment, one of our few direct references to the art of lyre playing in Greece of the fifth century, is preserved in the treatise, Isagôgê harmonikê, written by Cleonides, an otherwise unknown author of the Aristoxenian school of theorists.2 Cleonides, enumerating the four significations of the word tonos (sound, interval, region of the voice, tension), takes up first its sense as phthongos or "sound." According to Cleonides, it is in this sense that Terpander and Ion have called the phorminx heptatonos. After citing Terpander (Jan 202; Fr. 4, 3s D), Cleonides then quotes the above fragment of Ion, in which heptatonon in line three also, according to Cleonides, illustrates the sense of "sound." Beyond this, Cleonides gives no other information which might assist in the interpretation of these lines. Although the text has reached us in a corrupt form, the successive emendations of such scholars as Meibom, Bergk and Hermann have succeeded in ameliorating it to the extent that much of the original has been restored.3 Nevertheless, there has been much

<sup>1</sup> I am indebted to Professor Michael H. Jameson of the University of Pennsylvania, who read an earlier draft of this paper and made a number of helpful suggestions.

Ion's dates are usually given as ca. 490 B.C.—before 421 B.C. His fame as a tragedian and poet is well attested (cf. Ath. 1.3F; 14.645; 10.436; Arg. Eur. Hipp.), as is his acquaintance with various illustrious men of his time, such as Cimon, Themistocles, Pericles (Plut. Per. 5; Cim. 9.16), Sophocles (Ath. 13.603E), Aeschylus (Plut. De prof. virt. 8). For details see, T. B. L. Webster, "Sophocles and Ion of Chios," Hermes 71 (1936) 263-74; F. Jacoby, "Some Remarks on Ion of Chios," CQ 41 (1947) 1-17.

The following abbreviations are used: Jan=C. von Jan, Musici scriptores Graeci (Leipzig 1895); M=M. Meibom, Antiquae musicae auctores septem (Amsterdam 1652).

<sup>2</sup> The fragment is reproduced here from the text of Jan 202.

<sup>3 1.</sup> ἐνδεκ. Bergk Fr. Lyr. (page 5793, page 2534). τὴν (ante δεκαβ.) del. Hermann. ἔχουσα Meibom. ἔχοισα εἰς [τὰς] del. Wilamowitz, for which cf. E. Diehl, Anth. lyr. Gr. 1.63 (Leipzig 1949). 2. τριόδους Meibom for the ametrical τριώδους. 3. διὰ Bergk and Hiller; but there are two tetrachords on a seven stringed lyre. Cf. Jan 202.

disagreement among scholars about its meaning. Consequently, its evidential value for music of classical Greece, a field of study which suffers from a paucity of records, has never been fully assessed. The poem is addressed to a lyre of eleven strings:

- 1 O eleven stringed lyre with your ten step arrangement,
  2 ......
- 3 Formerly comprising seven strings in two tetrachords
- 4 All the Greeks played you, when they raised a meager music.

The second line is the focal point of the scholarly controversy, its contextual meaning never having been satisfactorily explained; it is therefore omitted from the above translation. In this paper we shall attempt to make this line intelligible in the light of information which the rest of the poem contains.

Theodore Reinach, in a study of the epigram,<sup>4</sup> has described the various interpretations proposed by scholars and has demonstrated at the same time the numerous problems it raises. His discussion has shown that attempts to render the Greek intelligibly are difficult to understand musically, while interpretations making musical sense have depended on violent emendations of the words. F. Gevaert, for example,<sup>5</sup> translated the line (without indicating the text he was using): "toi qui . . . possèdes un triple chemin pour les harmonies consonantes," which Reinach understood to suggest the following:<sup>6</sup>

ταις συμφωνούσαις άρμονίαις τρίοδον.

Reinach's observation that this translation, although satisfactory on the surface, is musically inadmissible, is justified. He argued that, if Gevaert meant by "triple way for concordant harmonies" three scales of transposition permitting the execution on one lyre of various alterations of key without retunings, then his explanation could not be supported by the testimony of any ancient harmonician. That is, the tonal scales conjectured by

<sup>&</sup>lt;sup>4</sup> Th. Reinach, "Un Fragment d'Ion de Chios," REG 14 (1901) 8-19.

<sup>&</sup>lt;sup>5</sup> F. Gevaert, Histoire et théorie de la musique dans l'antiquité 2 (Gand 1881) 261.

<sup>&</sup>lt;sup>6</sup> Reinach (above, note 4) 9.

<sup>&</sup>lt;sup>7</sup> To find these three scales on a lyre of eleven strings, Gevaert proposed the following intonation: G A Bb Bb C D Eb Eb F G A. The three scales would then be: G A B C D E F G; G A Bb C D E F G; G A Bb C D Eb F G. These would correspond to the octave species of Aristoxenus: Hypophrygian; Phrygian; Hypodorian.

Gevaert correspond in no way to the system of modes as they existed before Aristoxenus, nor can his proposed system of composite tuning in which chromatic notes are intercalated among diatonic (i.e. B and E; cf. note 7), be substantiated by ancient evidence.

H. Weil and Th. Reinach<sup>9</sup> suggested that the eleven strings of Ion's lyre comprised a disjunctive system permitting the execution of four octave scales—Mixolydian, Lydian, Phrygian and Dorian—this interpretation requiring the change from *triodous* to *tetoras* in the second line. Reinach, later noting numerous difficulties in this reading, retracted the idea himself.<sup>10</sup>

In his translation of Cleonides' Isagôgê, Ch.-Em. Ruelle observed 11 that triodous, construed by Meibom as an adjective—triplices 12—is more probably the accusative plural of the noun triodos meaning "cross-road," his definition being: "carrefour, rencontre de trois chemins." He then translated the line: "concours consonant de l'harmonie," apparently relating tas symphônousas to triodous (accusative plural) and construing harmonias as genitive singular. Ruelle's identification of the noun, "cross-road," offers no help, however, in determining the meaning of the line. The meeting point of three roads is a cross-road (trivium) but each of the roads is not a cross-road. Thus, it is impossible

<sup>&</sup>lt;sup>8</sup> Aristoxenus has given us a brief account of the scales used by the early harmonicians, in Harm. 37 M. Our most important evidence for the early scales is that offered by Aristides Quintilianus, De musica 21-22 M. This evidence is considered below, page 305. In her exhaustive work The Greek Aulos (London 1939) Kathleen Schlesinger has demonstrated that the formative principle in the generation of the ancient harmoniai (modes) on the aulos was the arithmetic progression in the harmonic series. This progression, through the equal measure or aliquot division of the air column (or string), was responsible for the generation of the harmoniai and of the whole modal system. The modal determinant for each harmonia is selected from the harmonic series; from this determinant a reversed harmonic series is constructed which embodies, through the equal division of the air column into aliquot parts, the mode generated from this determinant or harmonic. Thus the fourteenth harmonic, for example, the modal determinant for the Mixolydian mode, would determine the aliquot division of the pipe necessary to generate the material of this mode. In her words (page 12): "The modes are the sole and original creation of the descending or reversed series, due to equal measure by a specified Determinant, dividing string or pipe into aliquot parts."

<sup>9</sup> H. Weil and Th. Reinach, Plutarque de la musique (Paris 1900) 123, note.

<sup>10</sup> Reinach (above, note 4) 13-14.

<sup>&</sup>lt;sup>11</sup> Ch.-Em. Ruelle, L'Introduction harmonique de Cléonide (Paris 1884) 36-37, note 6.

<sup>12</sup> Meibom (above, note 1) Notae 63.

<sup>&</sup>lt;sup>13</sup> Cf. Reinach (above, note 4) 9.

to determine what the words "concordant cross-road of harmony" mean in terms of music.

Finally, Reinach, unsatisfied with these explanations, proposed a new solution based on the understanding of triodous as a singular noun, a synonym of triaina or trident. 14 He then emended the line: τῶν συμφωνουσῶν άρμονιῶν τριόδους. Although he gave no clear reasons, he understood harmoniôn to signify tetrachords. His translation, "trident de tetracordes consonants entre eux," was then related to a bizarre device invented by a certain Pythagoras of Zacynthus (described by Athen. 14. 637B-F). This contrivance, called a tripous or tripod, accommodated in the three spaces between its legs a set of strings in each space. One set was tuned to the Dorian mode, one to the Phrygian, and one to the Lydian. This arrangement enabled a player to shift to a different mode by rotating the tripod to a new set of strings, thus avoiding the nuisance of retuning. According to Reinach, therefore, Ion has described in the second line, a trident contrivance similar to Pythagoras' tripod.

This ingenious interpretation is liable to several objections. First, Reinach's suggestion that such a trident, if it ever existed at all, could function as did Pythagoras' tripod, seems unjustified. That is, where would the three sets of strings be accommodated between the bars of a trident? Secondly, if they could be so arranged, why would these strings be restricted to the limitations of a tetrachord? A final damaging factor is that there is no ancient report which gives any testimony for the existence of such a trident. The Pythagoras whose device is noted by no one but Athenaeus cannot be dated with any certainty (he is mentioned briefly by Aristoxenus, Harm. 36 M), so that it is impossible to determine whether Ion could have been acquainted with him or his tripod. Although Reinach's proposal has a certain linguistic attraction, his shift from tripod to trident cannot be realistically understood. Finally, even if these serious difficulties could be somehow removed, this interpretation is weakened through its dependence on the emendation of no less than three words in the line.

14 Reinach (above, note 4) 17–18. The examples of trident which he offers are: Pindar, Ol. 9.30; Isth. 8.38; Plato, Soph. 220c; Agathon, Fr. 4 (Nauck), who in his tragedy Telephus compared the letter E to a triodous plagios.

15 It is surprising that Reinach did not avail himself of evidence concerning the

trigônos, a stringed instrument of triangular form, which has the more reliable authority of Plato, Rep. 399c, for its existence.

A chief obstacle to the correct understanding of the line is the seemingly deliberate ambiguity in the inflectional endings of the words. The ending -as could in the case of symphônousas and harmonias be construed either as genitive singular or accusative plural. Thus, symphônousas could modify harmonias with either construction or the accusative plural triodous.

A further difficulty concerns the meanings of the words themselves, each of them having a wide semantic range, as evinced in the ancients' use of them. Triodous in particular is hard to understand in terms of lyre music. Some scholars have seen in the term a reference to tetrachords. D. B. Monro, for example, related it to the three conjunct tetrachords of the Lesser Perfect System (hypatôn, mesôn, synemmênôn) of Aristoxenus. <sup>16</sup> C. von Jan concluded that it referred to the three tetrachords of Aristoxenus' Greater Perfect System (hypatôn, mesôn, diezeugmenôn). <sup>17</sup> Gevaert, however, related it to three scales of transposition; <sup>18</sup> and Reinach, as we have seen, attempted to introduce a new interpretation based on the meaning "trident." None of these views suggest in any way the meaning "cross-road" but (except for Reinach's trident) imply treis hodous.

Symphônousas signifies among the ancient theorists an agreement or blending of musical sounds. Several combinations of sounds are regarded as fulfilling the requirements of concordancy (symphônia), such as the fourth, fifth, octave, octave and a fourth, octave and a fifth, etc. Thus, if we understand Ion's words in the second line to signify "concordant cross-roads" or "concordant harmony," we must in either case determine the particular respect in which these elements are concordant.

*Harmonia* is even more diffuse in meaning. It was used in the Pythagorean sense of octave in the fifth and fourth centuries.<sup>21</sup>

<sup>&</sup>lt;sup>16</sup> D. B. Monro, The Modes of Ancient Greek Music (Oxford 1894) 37-38.

<sup>&</sup>lt;sup>17</sup> Jan 202: "de Ionis tribus tetrachordis... sunt autem toni: Si do re mi fa sol La si do re mi."

<sup>&</sup>lt;sup>18</sup> See above, note 7.

<sup>&</sup>lt;sup>19</sup> Cf. Bacchius, Isagôgê (Jan 293): Concordancy (symphônia) is "the blending of two sounds dissimilar in highness and lowness, in which the pitch of the lower sound is not more evident than that of the higher, nor is the pitch of the higher more evident than that of the lower." Practically the same definitions are given by Aristides Quintilianus, De mus. 12 M and Gaudentius (Jan 337).

<sup>&</sup>lt;sup>20</sup> Cf. H. S. Macran, The Harmonics of Aristoxenus (Oxford 1902) 235.

<sup>&</sup>lt;sup>21</sup> Nicomachus, Ench. (Jan 252) quoting Philolaus: "The size of an octave (harmonia) is a fifth and a fourth." See also Aristides Quintilianus, De mus. 18 M.

Aristoxenus (Harm. 36 M) says that his predecessors used it to denote the seven octave scales. Thrasyllus (ap. Theon of Smyrna; Hiller 48) used it to mean "organisation of systems." Aristoxenus (Harm. 48 M) used it in the sense of "enharmonic genus." Plato used the term with various significations. For example, in Philebus 17D it refers to "systems." The purest and most elevated of musical forms is to Plato the Dorian harmonia or mode (Laws 670B; Laches 188D). Elsewhere he regarded harmonia as the fundamental character underlying all music and drew the human soul to its likeness (Phaedo 86A). In Symp. 187B, harmonia signifies an accord, which supposes the existence of a principle through which is effected the relationship of opposites.<sup>22</sup> In *Phaedo* 86c, in Socrates' analogy between the attunement of the lyre and that of the soul, the term denotes the tuning of lyre strings. Aristophanes also used it in the sense of the tuning of lyre strings in Clouds 968. The meanings of harmonia thus range in these few examples from the most general, "an accord or attunement," to the most particular, "enharmonic genus and octave."

In order to determine what Ion meant in his use of these three words, it is necessary to examine the lyre itself which he described. The arrangement (taxin) of its strings and the scale principle to which these strings were tuned must then be ascertained.

The poem describes in reverse order the historical development of the lyre, skipping from the earliest type to the latest. Thus, the first two lines tell us what the contemporary lyre was like, the last two lines what sort of lyre the Greeks of former times (prin) played. The old lyre according to the poem had only seven strings, the music it was capable of producing being meager (spanian) in Ion's opinion. Further, these seven strings were arranged to comprise two tetrachords (dis tessara). Ancient evidence supports Ion's description of this early lyre, 23 so that it is possible to reconstruct it as follows:

The seven strings represented here in alphabetical notation comprise two conjunct tetrachords, the note A (mesê) being the point

<sup>&</sup>lt;sup>22</sup> Cf. E. Moutsopoulos, La musique dans l'oeuvre de Platon (Paris 1959) 321-47.

<sup>&</sup>lt;sup>23</sup> Nicomachus, *Excerpta* 1 (Jan 266); Plutarch, *De mus.* 30. Cf. J. Ćurtis, "Greek Music," *JHS* 33 (1913) 35–36. See also J. Chailley, "L'hexatonique grec d'après Nicomaque," *REG* (1956) 82.

of conjunction. The seven stringed lyre, associated with Terpander,<sup>24</sup> was not augmented by any string addition until about 530 or 520 B.C., when Pythagoras was said to have added an eighth string.<sup>25</sup> Thereafter the evolution of stringed instruments followed a regular course until, within a hundred years after the addition of the eighth string, instruments had increased to twelve strings. Phrynis is credited with the addition of the ninth string,<sup>26</sup> Histiaeus of Colophon with the tenth, Timotheus with the eleventh<sup>27</sup> and Melanippides with the twelfth.<sup>28</sup>

The whole question of the identification of the various string additions has resulted in a basic disagreement among scholars. It is believed here that an analysis of Ion's eleven stringed lyre may yield some interesting information in this connection. The disagreement involves two distinct theories: (1) the traditional view that a separate string was required for each note of the scale; (2) the principle of pentatonic tuning first proposed by Curt Sachs, <sup>29</sup> according to which a technique of "stopping" required that the lyre comprise a fewer number of strings than there were notes in the scale to be played. R. P. Winnington-Ingram has subjected the pentatonic theory to a searching critical analysis, in the course of which he has advanced a number of cogent arguments against the hypothesis. The evidence from ancient sources which he has adduced shows that, although the technique of stopping may have been used in some instances, the use of a

<sup>&</sup>lt;sup>24</sup> Terpander (Fr. 4. 3s D) in Cleonides, Isagôgê (Jan 202); Plutarch Inst. Lac. 17.

<sup>&</sup>lt;sup>25</sup> Nicomachus, Ench. 5 (Jan 244).

<sup>&</sup>lt;sup>26</sup> Plutarch, De prof. in virt. 13. However, Nicomachus, Excerpta 4 (Jan 274), attributes this addition to Prophrastus the Pierion.

<sup>&</sup>lt;sup>27</sup> Nicomachus, *Excerpta* 4 (Jan 274). Suidas 4.556 (Adler) attributed to Timotheus not only the eleventh string but also the tenth.

<sup>&</sup>lt;sup>28</sup> Plutarch, *De mus.* 30. Cf. E. Moutsopoulos (above, note 22) 88–92 on the evolution of stringed instruments.

<sup>&</sup>lt;sup>29</sup> C. Sachs, "Die griechische Instrumentalnotenschrift," Zeitschrift für Musikwissenschaft 6 (1924) 289–301. Sachs describes this theory in his two books: History of Musical Instruments (New York 1940) 131–35; The Rise of Music in the Ancient World (New York 1943) 203–5. See also the explanation offered by G. Reese, Music in the Middle Ages (New York 1940) 25.

<sup>&</sup>lt;sup>30</sup> Stopping, or the shortening of a string by finger pressure, produces a note of higher pitch than the string tone. Evidence on the technique of stopping derives from various sources. For example, Aristotle, *Prob.* 19.12, demonstrates the production of a tone an octave higher than the string tone by means of finger pressure (dialêpsis). Plato, *Philebus* 56A, implies that intervals other than the octave were thus produced.

<sup>&</sup>lt;sup>31</sup> R. P. Winnington-Ingram, "The Pentatonic Tuning of the Greek Lyre: A Theory Examined," CQ 50 (1956) 169-86.

standardized pentatonic accordature was not prevalent. In criticizing the pentatonic tuning hypothesis, he has demonstrated the various technical difficulties involved in stopping, the technique on which the entire pentatonic theory depends. Although the pentatonic theory itself rests on very slim foundations, he does concede that stopping may have been used. He says accordingly: "It may be that the Greek virtuosi, especially from the late fifth century onwards, succeeded in overcoming the difficulties to the extent of occasionally supplementing the open strings with a note of thinner tone obtained by stopping." 32

I think that an examination of the tuning principle of Ion's lyre will demonstrate the validity of Winnington-Ingram's conclusions. In my attempt to show that Ion's lyre was not tuned according to a pentatonic accordature, I hope further to prove that stopping was used in this case and to show what the results of this technique were.

The main feature of the pentatonic theory is a gapped accordature; that is, six strings tuned to a pentatonic scale would produce, by means of stopping, a diatonic octave. A lyre tuned, for example, to the sequence  $E\ G\ A\ B\ D\ E$  could, by means of stopping or shortening the E string and the B string, play the scale  $E\ f\ G\ A\ B\ c\ D\ E$  (lower case letters indicating the notes produced by stopping). If we apply this theory to Ion's lyre, we find that the eleven strings could accommodate a two octave compass. This is represented as follows (the numbers beneath the letters indicating the strings of the lyre):

ABcDEfGABcDEfGA 12 34 567 89 1011

Thus an eleven stringed lyre tuned in this way could encompass two octaves by means of stopping the second, fourth, seventh, and ninth strings. But the word *decabamona* in the first line of the poem precludes this possibility, for eleven strings comprising ten steps or intervals can mean nothing else than that a separate string was used for each degree of an eleven note series. Thus:

> BCDEFGABCDE 1 2 3 4 5 6 7 8 91011

<sup>&</sup>lt;sup>32</sup> R. P. Winnington-Ingram (above, note 31) 186.

<sup>&</sup>lt;sup>33</sup> G. Reese (above, note 29) 37 states that by ca. 400 B.C. "the standard number of strings on the kithara had been increased from seven to eleven which, in pentatonic tuning, would be sufficient to span two octaves."

An eleven stringed lyre, if tuned pentatonically, would accommodate a two octave scale of fourteen intervals. But an eleven stringed lyre comprising ten intervals would span an eleventh and would require that each note of the series have a separate string. Therefore, Ion's lyre was tuned according to the latter principle and not according to a pentatonic principle.

The arrangement of this lyre consists of cross-roads if we take taxin and triodous as in apposition.<sup>34</sup> Triodous in this context signifies, then, two or more points at each of which three musical forms meet, these points being, conceivably, single notes or certain intervals which are concords. Construing harmonias as genitive singular, we could translate:

Eleven stringed lyre, having as your ten step arrangement the concordant cross-roads of harmony.

Harmony in this frame could reasonably signify the tuning arrangement 35 of the eleven strings so as to produce a setting wherein several modes might meet at certain junctures.

If Ion is referring to the fact that this lyre could play a multiplicity of modes without retuning, we must next determine whether there is any ancient evidence which could support this supposition. Unfortunately, musical records are almost non-existent for this early period. Of the sixteen bits of actual music which remain, only the mutilated fragment from the score of Euripides' *Orestes* can be dated with certainty as being from the fifth century.<sup>36</sup> The only other musical document of comparable antiquity is the melody set to the opening of Pindar's

<sup>&</sup>lt;sup>34</sup> The apparent awkwardness of these appositional accusatives gave rise to the emendation in the second line  $\epsilon is$  [ $\tau \dot{\alpha}s$ ], for which cf. Diehl (above, note 3). J. M. Edmunds, *Elegy and Iambus* 1 (London 1931) 433, thus translated it: "Eleven stringed lyre with thy flight of ten steps | into the place where the three concordant roads of Harmonia meet..."

<sup>&</sup>lt;sup>35</sup> Cf. R. P. Winnington-Ingram, "Greek Music," Grove's Dictionary of Music and Musicians 3 (London 1954) 777: "The word 'harmonia' means, among other things, a 'tuning'."

<sup>&</sup>lt;sup>36</sup> For complete information about this and the other fragments see, J. F. Mountford, "Greek Music in the Papyri and Inscriptions," New Chapters in the History of Greek Literature, ed. J. U. Powell and E. A. Barber, 2nd ser. (Oxford 1929) 146–83 and 169 in particular. The fragment is reproduced with numerous restorations by E. Martin, Trois documents de musique greeque (Paris 1953) 14. See also D. D. Feaver, "The Musical Setting of Euripides' Orestes," AJP 81 (1960) 1–15.

first Pythian Ode. This has generally been regarded as a forgery, however.37 No theoretical works of the fifth century are comparable in completeness to the treatises of Aristoxenus and his followers, whose writings constitute substantial evidence for later stages in Greek musical development. Some theoretical evidence for the fifth century has come down to us, however, in the form of fragments scattered through Greek literature,38 and from this scant body of information, it is possible to discover references to musicians' use of such a multiplicity of modes as Ion's poem implies. This implication has been seen, for example, by F. Lasserre who says: "A qui objecterait toutefois que cette interprétation par polytonalité présuppose un système harmonique non attesté...on peut répondre par le témoignage formel de Platon et par l'example du Lydien dont les trois tonalités sont connues déjà de Damon."39 Plato is also known to have deplored the introduction of many-stringed instruments, believing that such innovations gave rise to certain undesirable elements in music.40

The most specific information regarding the modes used by musicians at this time is contained in the well known passage Rep. 398E in which Glaucon enumerates for Socrates at least six modes and their relative ethical values. If we add to this information the facts in Rep. 443D, some highly significant details emerge. Here, Plato likens the parts of the soul to the three limits of harmony:  $\mathring{\omega}\sigma\pi\epsilon\rho$   $\mathring{o}\rho\sigma\nus$   $\tau\rho\epsilon\hat{\iota}s$   $\mathring{\alpha}\rho\mu\nu\iota\hat{\alpha}s$   $\mathring{\alpha}\tau\epsilon\chi\nu\hat{\omega}s$ ,  $\nu\epsilon\hat{\alpha}\tau\eta s$   $\tau\epsilon$   $\kappa\hat{\alpha}i$   $\mathring{\nu}\pi\acute{\alpha}\tau\eta s$   $\kappa\hat{\alpha}i$   $\mu\acute{\epsilon}\sigma\eta s$ . These words, reminiscent of Ion's harmonias triodous, allude to a musical reality: the  $n\hat{e}t\hat{e}$ , hypatê, and mesê, defining the strings of the lyre and corresponding to the fixed sounds of a harmony—that is, the attunement of all the strings. Furthermore, they doubtless pertain to the set of modes which Aristides Quintilianus (De mus. 21–22 M) attributed to the pany palaiotatoi,  $^{41}$  and which he further identified as the six

<sup>&</sup>lt;sup>37</sup> Cf. R. P. Winnington-Ingram, *Mode in Ancient Greek Music* (Cambridge 1936) 32, note 1. K. Schlesinger is convinced of its authenticity, however (above, note 8) 358–59.

<sup>&</sup>lt;sup>38</sup> Cf. F. Lasserre, *Plutarque de la musique* (Olten and Lausanne 1954) 74–79 and the introduction (13–95) entitled "L'éducation musicale dans la Grèce antique."

<sup>&</sup>lt;sup>39</sup> Lasserre (above, note 38) 173-74.

<sup>40</sup> Rep. 399c; 398p; 410A; Laws 812D-E. Cf. Plutarch, De mus. 15 and 22.

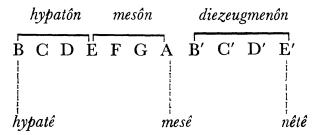
<sup>&</sup>lt;sup>41</sup> Cf. E. Moutsopoulos (above, note 22) 338–39.

modes to which Plato referred in *Rep.* 398E.<sup>42</sup> They are given as follows (quarter-tones indicated by +):<sup>43</sup>

Lydian
$$E+FAB'B+'C'E'E+$$
Dorian
$$DEE+FAB'B+'C'E'$$
Phrygian
$$DEE+FAB'B+'C'D'$$
Iastian
$$BB+CEGA$$
Mixolydian
$$BB+CDEE+FB'$$
Syntonolydian
$$BB+CEGG$$

The entire series spans an interval of an eleventh from B to  $E^{\prime 44}$  which, as we have seen, is the range of Ion's lyre. One type of tetrachordal sequence is dominant in all six modes—the enharmonic, consisting of quarter-tone, quarter-tone, ditone. This pattern is indicated by brackets above the letters. The limit of each tetrachord is, of course, a concord, the fourth.

If now we construct a series of notes representing the tuning of Ion's lyre, we shall see that four notes in Aristides' set of modes are in excess of this tuning (B+, E+, B+', E+'):



The strings B, A, and E' may be identified as the three limits mentioned by Plato (Rep.~443D)—hypatê~hypatôn, mesê~and~nêtê~diezeugmenôn~respectively. The enharmonic tetrachords in Aristides' modes thus evidently correspond to the three tetrachords in Aristoxenus' Greater Perfect System. That is, the tetrachord comprising the interval <math>B-E in Aristides' modes

- <sup>42</sup> The authenticity of this evidence has been demonstrated by J. F. Mountford, "Greek Music and its Relation to Modern Times," *JHS* 40 (1920) 25–28. See also J. F. Mountford, "The Musical Scales of Plato's Republic," *CQ* 17 (1923) 125–36; M. I. Henderson, "The Growth of the Greek Harmoniai," *CQ* 36 (1942) 94–103; R. P. Winnington-Ingram (above, note 37) 22–30.
- <sup>43</sup> Aristides' Lydian is noted in the Hypolydian key (enharmonic); the remainder are noted in the Lydian (diatonic and enharmonic); the Iastian and Syntonolydian may be regarded as noted in the Hypolydian with the *synêmmenôn* tetrachord. Cf. Winnington-Ingram (above, note 37) 22, note 2. For the sake of clarity, we have transposed these to a fourth below.
  - 44 Cf. Winnington-Ingram (above, note 37) 23, note 1.
  - 45 For these identifications see Cleonides, Isagôgê (Jan 1822).

corresponds to the tetrachord hypatôn; the tetrachord comprising the interval E-A corresponds to the tetrachord mesôn; the tetrachord comprising the interval B'-E' corresponds to the tetrachord diezeugmenôn. The tetrachord hypatôn (B-E) is a concord in which the three modes participate—Iastian, Mixolydian, Syntonolydian—and for this reason could be termed a triodos. The tetrachord diezeugmenôn (B'-E') is a concordant juncture for the three modes: Lydian, Dorian, Phrygian. The tetrachord mesôn (E-A) is a concordant juncture shared by the two modes: Dorian and Phrygian. The Lydian may very likely have some affinity with these modes through its truncated formation of the tetrachord mesôn. The Lydian mesôn of the tetrachord mesôn.

There are, then, according to this explanation, three junctures in the form of tetrachords, through which three modes cross paths. These junctures or cross-roads are not only concords themselves but are also concordant between themselves (the mesôn is a fourth above the hypatôn; the diezeugmenôn is a fifth above the mesôn and an octave above the hypatôn). The word symphônousas would therefore describe them most accurately. Through these tetrachordal cross-roads, each shared by three modes, modulation from one mode to another could easily be effected without retuning. Such modulational possibilities thus seem to justify the concept of "concordant cross-roads."

The strings of Ion's lyre, tuned to the sequence described above (305), could produce all six modes of Aristides without retuning, the four notes in excess of the eleven strings being produced by stopping.<sup>48</sup> This may be diagrammed as follows (lower case letters indicate the notes produced by stopping):

<sup>46</sup> These names, used to denote the notes of the scale and the various tetrachords to which these notes belonged, identified the positions of the lyre strings. Thus hypatôn, "of the highest sounds," refers to the highest or top strings, which produce, however, the lowest pitched notes of the scale. Mesôn is the tetrachord "of the middle," and diezeugmenôn the tetrachord "of the disjunctive." Hypatê, literally translated, means "highest note," indicating the position of this string on the lyre. In reality it denotes the note of the lowest pitch. Hence nêtê, the lowest string, produces the highest pitch. For further explanation, see H. S. Macran (above, note 20) 41–43.

<sup>&</sup>lt;sup>47</sup> Cf. Lasserre (above, note 38) 39.

<sup>&</sup>lt;sup>48</sup> Lasserre (above, note 38) 40, note 1: "Les notes en surnombre, en revanche, seraient celles qu'on obtenait à partir de l'accord initial par une pression du doigt ou du plectre sur la corde."

The quarter-tone intervals, characteristic of the enharmonic tetrachords in Aristides' modes, are thus produced by stopping the first, fourth, eighth and eleventh strings.

The Orestes fragment (above, 303), the earliest piece of Greek music we have, could have been played on a lyre tuned in the way described above. This fragment employs the diatonic lichanus hypatôn—G (= D in our transcription)—alongside the notes of the enharmonic pyknon (of the Lydian key). This interesting feature occurs also in the early modes preserved by Aristides (above, 305). In the proposed tuning of Ion's lyre these diatonic notes in Aristides' modes would be produced by the open strings 3(D), 6(G) and 10(D'). The melody of the Orestes fragment is noted in the Phrygian mode of Aristides, the two highest notes of this mode being absent from the melody, however. The enharmonic notes in the Orestes melody could be produced by stopping the fourth and eighth strings of Ion's lyre.

The second line of this poem, then, considered in terms of this evidence from Plato and Aristides Quintilianus, becomes meaningful now: "the concordant cross-roads of harmony" are the three enharmonic tetrachords shared by the six modes of Aristides. The "harmony" of the lyre is a tuning of its strings which, by means of stopping, will accommodate all six modes without the need for retuning. Further, the *Orestes* fragment accords well with this view. An advantage of this interpretation is that it does not require emendation of any word in the line.

The information which has emerged from the foregoing examination is important as evidence for Greek music of the fifth century for the following reasons:

- 1. The poem shows clearly that a fifth century lyre did not necessarily depend on a pentatonic accordature for its performance.
- 2. The accordature of this lyre, in its ability to accommodate on its eleven strings the six modes mentioned by Plato and documented by Aristides Quintilianus, emphasizes an early tetrachordal system within the six modes. This system has evident correspondences to the later Greater Perfect System of Aristoxenus.
- 3. The melody of the *Orestes* fragment agrees throughout with this interpretation.

<sup>&</sup>lt;sup>49</sup> Cf. J. F. Mountford (above, note 36) 169. Also, R. P. Winnington-Ingram (above, note 37) 32.



The Spondeion Scale. Pseudo-Plutarch de Musica, 1134f-1135b and 1137b-d

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### THE SPONDEION SCALE.

PSEUDO-PLUTARCH DE MUSICA, 1134F-1135B AND 1137B-D.

Our information about the early stages of Greek music is so slight that these references of the Pseudo-Plutarch to a scale employed by the legendary figure Olympus take on an immense value for us. The dialogue itself is an unskilful patchwork, but the author's sources are often good. These particular passages are almost certainly both derived with small alteration from Aristoxenus, in whose time the traditional music ascribed to Olympus was still in use. For the elucidation of the scale's history and structure we have three pieces of evidence to help us. There is the first passage mentioned above, which deals with the discovery of the enharmonic genus by Olympus, which is connected, at first sight obscurely, with the Spondeion scale; and the second passage, which discusses the scalar limitations of the  $\sigma \pi o \nu \delta \epsilon \iota \acute{\alpha} \zeta \omega \nu \tau \rho \acute{\sigma} \pi o s$ , with especial reference to an elementary polyphony. There are also the ancient scales quoted by Aristides Quintilianus (ed. Meibom, p. 21).

Our best starting-point will be Plutarch's account (1134F) of the origin of the enharmonic, which runs as follows (in Weil and Reinach's edition, §§ 104-117):

(104) 'Όλυμπος δὲ, ὡς 'Αριστόξενός φησιν, ὑπολαμβάνεται ὑπὸ τῶν μουσικῶν τοῦ ἐναρμονίου γένους εὑρετὴς γεγενῆσθαι· (105) τὰ γὰρ πρὸ ἐκείνου πάντα διάτονα καὶ χρωματικὰ ἦν. (106) ὑπονοοῦσι δὲ τὴν εὕρεσιν τοιαύτην τινὰ γενέσθαι. (107) ἀναστρεφόμενον τὸν "Ολυμπον ἐν τῷ διατόνφ καὶ διαβιβάζοντα τὸ μέλος πολλάκις ἐπὶ τὴν διάτονον παρυπάτην, τοτὲ μὲν ἀπὸ τῆς παραμέσης τοτὲ δὲ ἀπὸ τῆς μέσης, καὶ παραβαίνοντα τὴν διάτονον λιχανόν, (108) καταμαθεῖν τὸ κάλλος τοῦ ἤθους, καὶ οὕτω τὸ ἐκ τῆς ἀναλογίας συνεστηκὸς σύστημα θαυμάσαντα καὶ ἀποδεξάμενον, ἐν τούτω ποιείν ἐπὶ τοῦ Δωρίου τόνου. (109) οὔτε γὰρ των τοῦ διατόνου ἰδίων οὖτε των τοῦ χρώματος ἄπτεσθαι, ἀλλ' οὐδὲ των τῆς άρμονίας. (110) είναι δ' αὐτῷ τὰ πρῶτα τῶν ἐναρμονίων τοιαῦτα · τιθέασι γὰρ τούτων πρώτον τὸ σπονδεῖον, ἐν ῷ οὐδεμία τῶν διαιρέσεων τὸ ἴδιον ἐμφαίνει, (ΙΙΙ) εἰ μὴ τις εἰς τὸν συντονώτερον σπονδειασμὸν βλέπων αὐτὸ τοῦτο διάτονον είναι ἀπεικάση · δήλον δ' ὅτι καὶ ψεῦδος καὶ ἐκμελὲς θήσει ὁ τοιοῦτο τιθείς · (ΙΙ2) ψεῦδος μεν, ὅτι διέσει ἔλαττόν ἐστι τόνου τοῦ περὶ τὸν ἡγεμόνα κειμένου: (113) ἐκμελὲς δὲ, ὅτι, καὶ εἴ τις ἐν τῆ τοῦ τονιαίου δυνάμει τιθείη τὸ τοῦ συντονωτέρου σπονδειασμοῦ ἴδιον, συμβαίνοι ἂν δύο έξης τίθεσθαι δίτονα, τὸ μὲν ἀσύνθετον, τὸ δὲ σύνθετον. (ΙΙ4) τὰ μὲν οὖν πρῶτα τῶν ἐναρμονίων τοιαῦτα · (ΙΙ5) τὸ γὰρ

1 Or four, if we include the reference of Aristides Quintilianus (p. 28, Meibom) to an interval  $\sigma \pi o \nu \delta \epsilon \iota a \sigma \mu \delta s$ , consisting of a rise of three-quarters of a tone. This must certainly have some connexion with the Spondeion scale. It is, however, possible that Aristides' only authority

for it was the passage of Aristoxenus, that Plutarch himself makes use of. Aristides probably was in possession of books of Aristoxenus which are lost to us, and very possibly culled from one of them his list of ancient scales (cf. J. F. Mountford in C.Q., Vol. XVII.).

ἐν ταῖς μέσαις ἐναρμόνιον πυκνὸν, ῷ νῦν χρῶνται, οὐ δοκεῖ τοῦ ποιητοῦ εἶναι· ράδιον δ' ἐστὶ συνιδεῖν, ἐάν τις ἀρχαικῶς τινος αὐλοῦντος ἀκούση· ἀσύνθετον γὰρ βούλεται εἶναι καὶ τὸ ἐν ταῖς μέσαις ἡμιτόνιον· (II6) ὕστερον δὲ τὸ ἡμιτόνιον διηρέθη ἐν τε τοῖς Λυδίοις καὶ ἐν τοῖς Φρυγίοις. (II7) φαίνεται δ' "Ολυμπος αὐξήσας μουσικὴν τῷ ἀγένητόν τι καὶ ἀγνοούμενον ὑπὸ τῶν ἔμπροσθεν εἰσαγαγεῖν, καὶ ἀρχηγὸς γένεσθαι τῆς Ἑλληνικῆς καὶ καλῆς μουσικῆς.

The text of this passage is fairly sound, and, although we may have doubts about the exact order of the sentences, the meaning is fairly clear.

On the grounds of the last sentence Aristoxenus or Plutarch has been accused of muddle-headedness. This is quite unfair. It is true that Olympus according to this account did not introduce the quarter-tones of the enharmonic genus, but it is equally true that these quarter-tones were not the only characteristic of the enharmonic; the omission (hypothetical) of the G and the resulting δίτονος λιχανός were an essential preliminary to the splitting of the semitone, which may originally have been in the nature of an ornament. We need not, of course, believe any actual musician to have omitted a note in the diatonic series. Olympus, as we have seen, was a legendary figure; the enharmonic was no accidental discovery. The tradition amounts to this—that Greeks at some point before accurate musical history begins came in contact with a type of music which used the  $\delta i \tau o \nu o s$   $\dot{a} \sigma \dot{v} \nu \theta \epsilon \tau o s$ , and adopted it and the quarter-tones, which were an elaboration of it. Plutarch calls it 'Hellenic and beautiful.' On any theory it is curious that music, regarded as the invention of Olympus and subsequent to the diatonic, should be called 'Hellenic.' It is accounted for by the later popularity of this style, and particularly by Aristoxenus' glorification of it. The gapped scale, then, which the enharmonic implies, was a real contrast to a completer series of diatonic notes which we can assume to have been pre-existent in Greece, and 'Olympus' really did enrich Greek music with a new element. The legend of the manner of his discovery is a picturesque fiction emphasizing that contrast; we need not pursue its details so far as to ask in what exact scale, mode, or key Olympus was playing when he made his great 'discovery.' We are told, however, that he constructed a Dorian scale ἐκ τῆς ἀναλογίας. This can only mean that the later Greeks were aware of an old scale of this sort: EF ABC (E).

'Such,' continues our author, 'was the character of the first enharmonic compositions of Olympus, for they count as the first of them the Spondeion, in which none of the (tetrachordal) divisions manifests its peculiarities.' The  $\sigma\pi\sigma\nu\delta\epsilon\hat{\iota}\sigma\nu$ , then, bore some relation, possibly of identity, to the earliest enharmonic music.¹ Further, it contained no notes characteristic of any of the genera—that is, it had neither the diatonic lichanos and  $\delta\hat{\iota}\tau\sigma\nu\sigma$ , nor, at least as yet, the  $\pi\nu\kappa\nu\delta\nu$ . Weil and Reinach (§ 110, n.) quote a number of passages to prove that it was a Dorian scale. This seems very probable, in which case it must have been very similar to the scale written out a few lines

<sup>1</sup> Probably it was the name given to the wise known as τὰ Δώρια. We know that Phrygian Dorian varieties of the early enharmonic, otherand Lydian varieties also existed. See p. 90 n.

above. Further information, however, is given about it in the Plutarch text. There was, he says, in it an element that might be described as diatonic namely, 'the higher spondeiasmus'; this, however, was an erroneous way of looking at it, and implied an unmelodious succession of intervals—a ditone  $(\sigma \dot{\nu} \nu \theta \epsilon \tau o \nu)$  followed by a ditone  $(\dot{a} \sigma \dot{\nu} \nu \theta \epsilon \tau o \nu)$ . This is of course impossible according to the principles of Aristoxenus; and it is carefully explained that the σπονδειασμός interval is not a tone, but three-quarters of a tone, smaller, that is, than the disjunctive tone which precedes it. We get, then, a scale of this sort: 1 EF AB C\*. The look of it not being liked by editors, it is suggested that Aristoxenus, who can almost certainly be accounted the actual author of the sentences in question (the argument proceeds according to the canons laid down in his Harmonics, Bk. III.), has made a mistake, interpreting an old σπονδειασμός of three semitones (the Pythagorean δίεσις, see Philolaus, ap. Nic. 9; Adrastus, ap. Theo., p. 55, Hiller) as though it were of three modern διέσεις, or quarter-tones.2 When it was seen that this alteration gave a scale EF AB D(E) not only closely resembling the τρόπος σπουδειάζων of the later passage in the dialogue, as usually interpreted, but also the supposed defective heptachords of Terpander and Philolaus, belief in this hypothesis was much strengthened. We shall see that there is no more reason to believe in the one than in the other. Apart from that, however, we should not accuse Aristoxenus of so grave a mistake without good reason. This theory leads us to assume either that the interval known as  $\sigma\pi\sigma\nu\delta\epsilon\iota\alpha\sigma\mu\delta\varsigma$  changed from a tone and a half to three-quarters of a tone concurrently with the change of usage of the word δίεσις, which is absurd; or that there never was an interval σπονδειασμός in the σπονδείον scale, but merely one of three semitones, which Aristoxenus mistook by a verbal mistake for the later  $\sigma \pi o \nu \delta \epsilon \iota a \sigma \mu \delta \varsigma$  that he knew, which is also absurd; or else that the only  $\sigma \pi o \nu \delta \epsilon \iota a \sigma \mu \delta \varsigma$  there ever was was of three Pythagorean διέσεις, and that Aristides (p. 28, Meibom) merely perpetuated the mistake of Aristoxenus and described a never existing interval, which is just possible, but unlikely. Aristoxenus in the Plutarch passage is describing, surely, a scale he knew, not one he had laboriously reconstructed from a purely verbal tradition. We must then believe in the scale as given by Plutarch in default of some valid reason for rejecting it.

We come next to the  $\tau\rho \delta \pi o s$   $\sigma \pi o \nu \delta \epsilon \iota \acute{a} \zeta \omega \nu$ . Various notes of this scale are mentioned (Plut., § 172, etc.) in an attempt to prove that the ancients had limited their art by omitting from their scales notes they might have employed. It is a curious way of putting it, but not so erroneous as is sometimes suggested if we believe that the complete diatonic series was known comparatively early, and used concurrently with less complete scales of possibly non-Hellenic origin. Three notes in particular, according to this passage, were not employed in the  $\tau \rho \delta \pi o s$   $\sigma \pi o \nu \delta \epsilon \iota \acute{a} \zeta \omega \nu$ —namely,  $\tau \rho \iota \tau \eta$ ,  $\nu \dot{\eta} \tau \eta$ , and ' $\tau \rho \iota \tau \eta$   $\sigma \nu \nu \eta \mu \mu \dot{\epsilon} \nu \omega \nu$ .' (The

<sup>&</sup>lt;sup>1</sup> The symbol \* after a note here indicates that it is raised by a quarter of a tone.

<sup>&</sup>lt;sup>2</sup> Greif also (Rév. des Et. G., 1910) makes the same assumptions to produce the scale

<sup>(</sup>D) EF AB? C#D. But he assumes, further, that Aristoxenus was completely misinformed about the scale, and imported the disjunctive tone into his account.

erroneous text of Weil and Reinach will provide a convenient starting-point for our argument.) However, though they were not employed in the melody, they were employed in the accompaniment in the following manner:  $\tau\rho i\tau\eta$  consonantly with  $\pi a\rho \nu \pi i\tau\eta$ ;  $\nu \eta \tau \eta$  dissonantly with  $\pi a\rho a\nu \eta \tau \eta$  and consonantly with  $\mu \epsilon \sigma \eta$  and  $\pi a\rho a\mu \epsilon \sigma \eta$ ;  $\tau \rho i\tau \eta$   $\sigma \nu \nu \eta \mu \mu \epsilon \nu \omega \nu$  dissonantly with  $\pi a\rho a\nu \eta \tau \eta$  and  $\lambda \iota \chi a\nu \delta s$  (again adopting for the moment the readings of Weil and Reinach). According to their interpretation we now have a scale with the following scheme:

$$μέλος$$
 - - E F G A B D  $κροῦσις$  - - B $ρ$  C E

This is naturally brought into relation with the supposed defective scale of Philolaus, with its  $\tau \rho i \eta \mu i \tau \acute{o} \nu i o \nu \acute{a} \sigma \acute{v} \nu \theta \epsilon \tau o \nu$ , and with the  $\sigma \pi o \nu \delta \epsilon \hat{i} o \nu$  of the earlier Plutarch passage, emended to correct the supposed mistake of Aristoxenus and endowed with a diatonic lichanos. (For the moment we can disregard the notes of the accompaniment; the rest of the scale existed before they were employed, which cannot have been earlier than the time of Archilochus.) We have seen that there is no good reason to believe in this 'howler' of Aristoxenus. There is no more reason for supposing that the σπονδείον ever had a diatonic lichanos. In the earlier passage we are told that the  $\sigma\pi\sigma\nu\delta\epsilon\hat{\iota}\sigma\nu$ of Olympus was an enharmonic of the early type which had no quarter-tones such were the first enharmonics; later the semitone was divided. This is the implication. It is, then, natural to suppose that the  $\sigma \pi o \nu \delta \epsilon \hat{i} o \nu$  remained enharmonic, and that Aristoxenus (if Aristoxenus it is) in referring to its notes refers to the notes of the enharmonic genus, not the diatonic. This is the natural assumption in the absence of specific instructions to the contrary. The notes of the melody then become EE\*F ABC; those of the accompaniment, B\* and E ('τρίτη συνημμένων' shall be left for separate and later consideration).

This interpretation, besides being logical, has certain striking advantages and confirmations. In the first place, the scale it gives corresponds very closely with the scale of Olympus' enharmonic, as deduced from the Plutarch account, differing from it only in the split semitone of the lower tetrachord. It also corresponds with the early  $\sigma\pi\sigma\nu\delta\epsilon\hat{\iota}\sigma\nu$  discussed in the same passage, except that there is no suggestion that the B-C interval was widened to a three-quarter tone. But above all it simplifies the account here given of the polyphony of the  $\sigma\pi\sigma\nu\delta\epsilon\iota\acute{a}\zeta\omega\nu$   $\tau\rho\acute{o}\pi\sigma_{S}$ . Let us take the three accompanying notes one by one.

First, we are told (172) that the ancients abstained from the note  $\tau\rho i\tau\eta$ , the omission of which contributed to the characteristic effect of the style. In the accompaniment, however, it was used consonantly with  $\pi a\rho v\pi a\tau\eta$ . Of course, the  $\tau\rho i\tau\eta$  in any genus would always form the consonance of the fifth with the  $\pi a\rho v\pi a\tau\eta$ . There is no need here to mark a lacuna with Weil and Reinach, as there is no reason why Plutarch should necessarily have given more than one example; further, on our interpretation there is no other note

with which the  $\mu\epsilon\sigma\delta\pi\nu\kappa\nu\sigma\nu$ ,  $\tau\rho\iota\tau\eta$ , would form a likely interval, consonant or dissonant. Apart from the question of polyphony, the absence of the splitting of the semitone becomes most interesting when we turn to § 115. There we are told that the splitting of the semitone in the tetrachord  $\mu\epsilon\sigma\omega\nu$  was not the work of Olympus, implying that this was the first step; further, that the old-fashioned style of flute-playing in the day of Aristoxenus (presumably) tended to leave even the semitone in the tetrachord  $\mu\epsilon\sigma\omega\nu$  undivided—a fortiori, that in the tetrachord  $\delta\iota\epsilon\xi\epsilon\nu\gamma\mu\epsilon\nu\omega\nu$ . Here in section 172 we have implied a Spondeion scale, in which only the lower tetrachord has its semitone divided!

Sections 175-177 deal with  $\nu\eta\tau\eta$ . All accounts agree that this note did not form part of the early melodic compass, and most of them ascribe its addition to Terpander. It is not surprising, therefore, to find that it was not used in the Spondeion melodies, when even the diatonic scale had not attained to it. When the 'Dorian  $\nu\eta\tau\eta$ ' was added, it was not inserted ruthlessly in this well-established style of music, but used when polyphony came into practice in two ways—dissonantly with  $\pi\alpha\rho\alpha\nu\eta\tau\eta$ , consonantly with  $\mu\epsilon\sigma\eta$ . If we interpret  $\pi\alpha\rho\alpha\nu\eta\tau\eta$  as the enharmonic  $\pi\alpha\rho\alpha\nu\eta\tau\eta$  (=C) we abolish that discordant D-E interval, which has always made the orthodox theory of polyphony, if not slightly ridiculous, at least incomprehensible, and substitute for it an interval, the major third, just such as we should have expected the Greeks to employ if once they had wandered beyond those they recognized as consonant. The concordant use with  $\mu\epsilon\sigma\eta$  (E-A) needs no comment. It is unnecessary to add with Weil and Reinach  $\kappa\alpha\lambda$   $\pi\rho\delta$   $\pi\alpha\rho\alpha\mu\epsilon\sigma\eta\nu$  from 179, as we shall see when we examine the following sections.

Before proceeding to the last of the accompanying notes, however, we must digress to discuss shortly the defective scales ascribed to Terpander and Philolaus, which can be closely related to the Spondeion. We will deal with Philolaus first. Nicomachus, in the ninth chapter of his Encheiridion (Musici Scriptores Graeci, Teubner), quotes from him to illustrate the old Pythagorean terminology. He is describing the well-known harmonic framework (άρμονία), which can be represented by the notes E-A-B-E. Only he calls the note B, not  $\pi \alpha \rho \alpha \mu \acute{\epsilon} \sigma \eta$ , but  $\tau \rho \acute{\iota} \tau \eta$ . How is this? Nicomachus is at pains to explain, but gets himself into a terrible muddle in doing so. He has to imagine an original heptachord EFGAB DE, different from that he assumes in Chapter XI., and that the disjunctive tone (τοῦ διαζευγνύντος τόνου) was inserted between  $\pi a \rho a \nu \eta \tau \eta$  (D) and  $\tau \rho i \tau \eta$  (B)!  $T \rho i \tau \eta$  thereupon suffered a change of name to  $\pi$ αραμέση. Except for the last statement this is pure invention to account for the terminology of Philolaus, and took this form because Nicomachus imagined Philolaus was dealing with a normal diatonic scale. We in our turn now have to account for the Pythagorean's use of  $\tau \rho i \tau \eta$ . It is true it can only apply to a scale in which a single note separated it from  $\nu \dot{\eta} \tau \eta$ . Is the series more likely

Strictly the term 'Spondeion' should be reserved for the scale without quarter-tones.
 This is its development, the σπονδειάζων τρόπος.
 Section 270.

to have been B-D-E or B-C-E? In view of what we have seen of the old style (the  $d\rho\chi\alpha\iota\kappaol$   $\tau\rho\delta\pio\iota$  of Aristoxenus, p. 23), we can have no doubt that Philolaus was using the nomenclature of a scale in which  $\nu\eta\tau\eta$  (E) had been added to the old Spondeion without the division of the semitone B-C. B-C-E is not the tetrachord of later music, but the trichord of the archaic style (cf. Plutarch, § 171).

We may now turn to the Aristotelian problems for an account of the work of Terpander. Four problems of the nineteenth book deal with the heptachord, the octachord, and the position of  $\mu \acute{\epsilon} \sigma \eta$  in them. Problem 47 takes what we may describe as the orthodox view—that the heptachord was merely the octachord without the disjunctive tone, and that its  $\mu \epsilon \sigma \eta$  was the lowest note of its upper tetrachord. Problem 44 implies the same point of view. Problems 7 and 32, however, in answering their respective questions, refer to an omission of the note  $\tau \rho i \tau \eta$ , and the second of them associates this definitely with Terpander. Gevaert was probably right in regarding these references as interpolations; he was entirely wrong, however, in ascribing them to followers of Nicomachus and interpreting them diatonically. They must have been written by someone who knew the old Spondeion scale, and that in it the note τρίτη, the μεσόπυκνον, was not regularly employed, who knew also the tradition that Terpander had added the  $\nu \dot{\eta} \tau \eta$ . He therefore conceived that the innovator, finding a scale EE\* F ABB\*C (a kind of heptachord), had suppressed the  $\tau \rho i \tau \eta$  (B\*) in order to add the  $\nu \dot{\eta} \tau \eta$  (E). As an historical procedure this is of course improbable. It was not the addition of  $\nu \eta \tau \eta$  that caused the omission of  $\tau \rho i \tau \eta$ ; but the Plutarch passage is borne out in an interesting manner, and we can even believe that  $\nu \dot{\eta} \tau \eta$  came to be used with the old Spondeion before the splitting of the upper semitone. Gevaert objected that the scale in question must be diatonic, not enharmonic, because otherwise the hypothetical omission of  $\nu \dot{\eta} \tau \eta$  would leave a scale bounded not by a seventh, but by a sixth. is just such a scale that the interpolator contemplates, similar in compass to the old Spondeion and to the Syntonolydian of Aristides Quintilianus. Nor need we be distressed by the variation in the use of  $\tau \rho i \tau \eta$  between Philolaus and the Problems. Before the semitone was divided and the pycnon came into being, the nomenclature preserved by Philolaus may well have been used; the introduction of the μεσόπυκνον obviously renders a change necessary. Nicomachus was thus right on at least one point. We can now return to a consideration of the polyphony of the σπονδειάζων τρόπος.

A third suppressed note is there dealt with. The MSS. are unanimous in reading  $\sigma \nu \nu \eta \mu \mu \acute{e} \nu \omega \nu \nu \acute{\eta} \tau \eta$  (or some minor variant). Weil and Reinach, thanks to their interpretation of the nomenclature as diatonic, felt themselves compelled to emend  $\nu \acute{\eta} \tau \eta$  to  $\tau \rho \acute{\iota} \tau \eta$ , thus landing themselves in hopeless difficulties. On their theory, of course,  $\nu \acute{\eta} \tau \eta$   $\sigma \nu \nu \eta \mu \mu \acute{e} \nu \omega \nu$  is the same note as the  $\pi a \rho a \nu \acute{\eta} \tau \eta$ , already mentioned as a melodic note; also, it is not dissonant with the lichanos (D-G), as by § 179 it should be. But what is the  $\tau \rho \acute{\iota} \tau \eta$   $\sigma \nu \nu \eta \mu \mu \acute{e} \nu \omega \nu$ 

<sup>&</sup>lt;sup>1</sup> Problèmes Musicaux d'Aristote, Gevaert et Vollgraf.

doing in this scale at all? The Aeolian used it and perhaps the Mixolydian, but not the Dorian, to which this scale is related. Secondly, it is made to act as accompaniment to a note  $(\pi a \rho a \nu \dot{\eta} \tau \eta)$  higher than itself in contravention of what must have been a universal law (Ar. Prob. 19, 12). Thirdly, it is argued in the text that the early knowledge of this note was proved by the Phrygian melodies ( $\tau \hat{\alpha} \Phi \rho \hat{\nu} \gamma \iota \alpha$ ). Now what possible part can the note  $\tau \rho \hat{\iota} \tau \eta$ συνημμένων have had in a Phrygian scale? Weil and Reinach's suggestion of a modulation into the Aeolian is very weak. Yet it is this very mention of the Phrygian that gives us the clue and bids us restore the MS. reading. If we turn to the Phrygian of Aristides we see immediately that it gives us the Dorian, with the substitution of D for E; purged of quarter-tones, it is DEF ABCD. It is this upper D (called here  $\nu \dot{\eta} \tau \eta$   $\sigma \nu \nu \eta \mu \mu \dot{\epsilon} \nu \omega \nu$  because the term  $\pi a \rho a \nu \eta \tau \eta$  is already occupied by the enharmonic note of that description) which was used at a later stage in the accompaniment of the old  $\sigma\pi o\nu\delta\epsilon\hat{i}o\nu$ . It was so used, to follow the MSS., against  $\pi \alpha \rho \alpha \nu \dot{\eta} \tau \eta$  and  $\pi \alpha \rho \alpha \mu \dot{\epsilon} \sigma \eta$  and λιχανός dissonantly. Weil and Reinach wish to transfer καὶ πρὸς παραμέσην to § 176, as on their theory it makes a hideous discord. On ours, however, it is needless;  $\nu \dot{\eta} \tau \eta \ \sigma \nu \nu \eta \mu \mu \dot{\epsilon} \nu \omega \nu$  makes the interval of a minor third (D-B) with  $\pi \alpha \rho \alpha \mu \epsilon \sigma \eta$ , and this is as probable and reasonable as the major third between  $\nu\eta\tau\eta$  and  $\pi a\rho a\nu\eta\tau\eta$  (§ 176).  $\Lambda\iota\chi a\nu\delta\varsigma$  also provides the interval of a major sixth (D-F); again perfectly reasonable, and the type of interval which might have been expected.  $\Pi a \rho a \mu \epsilon \sigma \eta$  is not so obliging; D-C is a tone, which is just the interval which has been so fortunately eliminated from the discussion of the  $\nu\eta\tau\eta$  διεζευγμένων. It is perhaps a little arbitrary to reject the  $\pi\rho\delta s$  $\pi$ αρανήτην altogether, and as we have fortunately been able to confirm the manuscript reading in the rest of the passage it is a pity to abandon it here. It is however conceivable that the  $\pi a \rho a \mu \epsilon \sigma \eta \nu$  originally stood alone, then became accidentally duplicated, and one of the two was altered to  $\pi \alpha \rho \alpha \nu \dot{\eta} \tau \eta \nu$ by an ignorant copyist. This emendation has no ingenuity to commend If it is not accepted it will leave us precisely where we were before as far as the polyphony is concerned. It will only be accepted if it is considered worth while to eliminate the discord of the second. Probably no one would hesitate to do so if he were not already accustomed to the idea of its employment.

Still unexplained is the three-quarter tone interval in the old Spondeion scale. No hint is given in the second Plutarch passage that abnormal intervals were employed; but the first passage is explicit enough, and implies that the interval between  $\pi a \rho a \mu \acute{e} \sigma \eta$  and  $\pi a \rho a \nu \acute{\eta} \tau \eta$  (enharmonic) was a three-quarter tone. If the lower tetrachord had a normal semitonal  $\pi \nu \kappa \nu \acute{o} \nu$  (E-F), this would mean dissonance between F and C. Stranger phenomena are known in the history of scales, but this does not seem very like Greek music. Surely we have here the explanation of the debated expression  $\acute{o}$   $\sigma \nu \nu \tau o \nu \acute{o} \tau \epsilon \rho o s$   $\sigma \pi o \nu \delta \epsilon \iota a \sigma \mu \acute{o} s$ . The three-quarter tone interval occurred in both parts of the scale. Of course it was only the upper interval which, from its vicinity to the

disjunctive tone, could create an illusion of the diatonic. The misconception arose as follows. If F-E is three-quarters of a tone  $(\frac{12}{11})$ , then the interval A-F is  $\frac{11}{9}$ , which is almost identical with the interval  $\frac{27}{22}$ , made up by the disjunctive tone and the upper  $\sigma\pi\sigma\nu\delta\epsilon\iota\alpha\sigma\mu\delta\varsigma$ , differing in fact only by  $\frac{1}{198}$ . The uninstructed, assuming A-F to be a ditone, assumed further that C\*-A was the same.

Light is thrown upon the subject from two other sources. In the first place there is to be compared the hemiolic chromatic of Aristoxenus, the small intervals of which together make a three-quarter tone. This shows that he recognised a πυκνόν slightly larger than the enharmonic semitone, but smaller than the (minor) tone of the normal chromatic. The fact that he calls it chromatic, whereas the Spondeion was regarded as enharmonic, need not trouble us. Aristoxenus was always anxious to preserve the purity of the lowest type of enharmonic thanks to his connexion with virtuoso flute-playing. In any case, such a distinction as this was arbitrary and academic. Still more interesting is the ὅμαλον diatonic of Ptolemy (Harm. I. 16), of which the lowest interval is  $\frac{12}{11}$ —i.e. roughly a three-quarter tone—the complete tetrachord being  $\frac{12}{11} \times \frac{11}{10} \times \frac{10}{9}$ . It does not occur in the lyre scales he describes in Harm. II. 16. In fact, the account suggests that Ptolemy had invented it himself. It may, however, be a more or less conscious reflection of the Spondeion, which may not have become completely obsolete by then. If so, the original intervals of Olympus' scale were  $E_{11}^{12}$   $F_{9}^{11}$   $A_{8}^{9}$   $B_{11}^{12}$  C. We are told that Olympus in his discovery of the scale made frequent use of the tritone B-F, which probably means that this interval was much in use in this style. It is certainly more likely to have been the undecimal tritone \(\frac{11}{8}\) than the harsher  $\frac{45}{32}$  or the strict tritone  $\frac{729}{512}$ . It is not so easy to deal with the amplification of the scale through polyphony. The splitting of the threequarter tones produced an interval of a fifth between the two μεσόποκνα; this is clear enough on any showing.  $N\eta\tau\eta$  (E) was added, making an interval of a fifth with  $\mu \dot{\epsilon} \sigma \eta$  and of  $\frac{11}{9}$  with  $\pi \alpha \rho \alpha \nu \dot{\eta} \tau \eta$ , less harmonious unfortunately than the major third earlier suggested in this connexion. Νήτη συνημμένων also was added, making dissonant intervals with λιχανός and παραμέση. It is therefore extremely difficult to decide how the interval C-E  $(\frac{11}{9})$  was divided by the note D. If we take Ptolemy's tetrachord  $(\frac{12}{11} \times \frac{11}{10} \times \frac{10}{9})$ , we have a reasonable interval between D-B, i.e.  $\frac{6}{5}$ , a minor third, but an interval of  $\frac{33}{20}$ between D-F. If, on the other hand, we make our tetrachord  $\frac{12}{11} \times \frac{10}{9} \times \frac{11}{10}$ , with the larger tone in the middle, according to the canon which Ptolemy laid

only occurs in this passage and in the earlier passage about the Spondeion. They must only refer to a special type of early melody, and in sections 183-185 Plutarch is still discussing the  $\tau\rho\delta\pi\sigma$  or  $\sigma\tau\sigma\nu\delta\epsilon\iota\delta\zeta\omega\nu$  and cognate scales. Indeed this must be so, as  $\delta\pi\epsilon\dot{\iota}\chi\sigma\nu\tau$  can have no subject but of  $\pi\delta\lambda\omega\iota$ , which is made more explicit in § 181 ('Ολύμπου  $\tau\epsilon$  και  $\tau\omega\nu$  δκολουθησάντων  $\epsilon\kappa\epsilon\dot{\iota}\nu\omega$ ).

<sup>1</sup> The lower D, the ὑπερυπάτη, was not in use in this scale, as the continuation of the second Plutarch passage informs us in the following words: οὐ δι' ἄγνοιαν ἀπείχοντο ἐν τοῖς Δωρίοις τοῦ τετραχόρδου τούτου (τῶν ὑπάτων). Now the Dorian scale of Aristides possesses the note D. But there is no need to suppose that τὰ Δώρια necessarily refers to all Dorian melodies. This expression, together with τὰ Φρύγια and τὰ Λύδια,

down (and broke), the interval D-F becomes  $\frac{5}{3}$ , but that between D-B is This problem, however, is not peculiar to the tuning we are investigating. It is a natural law governing scales that a diatonic octave cannot have all its fifths and fourths perfect. Our own diatonic C-C has a false fifth between D-A. The normal Greek tuning has the same false interval, only in the E octave it becomes a false fourth between A-D. If then the Greeks preserved their normal structure of two tetrachords joined by a major tone, it was impossible for all the harmonies deduced from the Plutarch passage to be in tune. We need not here inquire whether they tolerated one harsh interval in their polyphony or in what way they solved this tuning problem. We have only to admit that the harmonies to which the three-quarter tone σπονδειασμός leads us are rather more difficult than those given by the normal diatonic tuning. If we believe them to have been too difficult, we must suppose that the  $\frac{12}{11}$  interval disappeared in the accompanied version of the scale, which preserved its original character only in the limitation of its melodic notes. All of which does not affect the main purpose of this paper to demonstrate the enharmonic character of the σπονδειάζων τρόπος, and so to vindicate the manuscript readings of the Plutarch passage which describes it.

#### R. P. WINNINGTON-INGRAM.

by dividing the two  $\pi \nu \kappa \nu \dot{\alpha}$  slightly differently. As this was flute music, and the whole  $\pi \nu \kappa \nu \dot{\delta} \nu$  was produced from a single hole of the pipe, this may not have presented much difficulty.

<sup>&</sup>lt;sup>1</sup> The problem is in point of fact soluble only if we suppose that the disjunctive tone (B-A) was a minor tone  $\binom{1}{9}$ , and that the consonance of a fifth between  $\tau \rho l \tau \eta$  and  $\pi \alpha \rho \nu \pi \acute{\alpha} \tau \eta$  was obtained



The Four Parent Scales of Modal Music Author(s): Ernest Clements

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# SIR PERCY C. BUCK, D.Mus., PRESIDENT, IN THE CHAIR.

# THE FOUR PARENT SCALES OF MODAL MUSIC. By Ernest Clements, Esq.

On the philosophical side all that I need do is to enter a protest against the prevailing materialism. The earth life is a school. Its first lesson is to draw inferences from the known to the unknown. That way lie faith, imagination and truth. There are three necessary inferences. One is bound to draw them in order to live one's life as it should be lived. They lead, when followed to a logical conclusion, to a belief in three worlds instead of one. These worlds are the world of the body, the world of the sentient soul, and the world of the spirit. As a working hypothesis one may assume that there are three atomic systems in the ether, and that when they are brought together and material from them grows up so as to function as one individual, there is life. The art of music has its roots in mind or spirit. Its basis is intonation, and intonation, like creation itself, comes from the science of numbers. The musician who scorns what he calls mathematics and acoustics and prefers to follow the dictates of his own sentient soul, is likely to be the slave of his environment. He should look higher and learn the properties of numbers as applied to vibrations and the interference of vibrations. He will find that music depends on the contrast between beats or interference and no-beats or consonance. Without heeding that contrast his instrument cannot be tuned. And that contrast is presumably the same in all the worlds of existence.

The theory of intonation is concerned therefore with ideals. The wise man in musical matters will not be content to submit his ideals to be measured or inferred by physical scientists. They are not competent to judge of such things. He will prefer to set up his own system of research.

The unity or tonality of a mode depends upon its scale, and the notes chosen as final and dominant. In studying the modes one must forget the major and minor and the conventions by which their unity or tonality is indicated and maintained. The mixture of two or more parent-scales in the

melody is, in the modes, a deadly sin. Each scale has its own selection of common chords; in the accompaniment they should predominate; when outside chords are admitted, they should be discords or chromatic chords, anything rather than a chord borrowed from another parent scale. It should be clear then that the modern musician who wishes to turn to the modes as his refuge against the abyss of cacophony must learn some-

thing of intonation.

We are now concerned with the hard diatonic. In the history of the art an honourable but subordinate place has been held by septimal or soft scales. I cannot bring myself to believe that undecimal scales have ever been used except by monochordal maniacs in the privacy of their homes. Soft scales, in which one or both of the semitones are reduced to a form derived from the seventh partial tone were in favour in the Alexandria of Ptolemy's time, and had been known to the Greeks for centuries. They are quite common in the Durbar music of India, and there are traces of them in Europe. Their best modes are the D, E and A modes. The F of the C mode is often softened when it occurs in the melody as the last note of a cadence over dominant harmony. But the hard 1 diatonic is always the mainstay of modal music. No one now believes in the ethos of the modes, or understands it. I want to show both by argument and example that it is a reality springing from the contrasts between these four scales.

### The Quintal Scale. C D E F G A B C'

The quintal scale is so called because it is tuned by fifths. It has five major tones and two diminished semitones. The ideal of the quintal musician is a ditonal E and an excruciatingly sharpened leading note. The quintal violinist prides himself on these non-harmonic habits. The slight flattening of the fifths known as "equal temperament," and the slight sharpening of the octaves as one goes up the scale of the piano. are not sufficient to disguise the intonation of the organ and the piano; they are essentially quintal instruments. In any mode, the ethos of this scale is listless and melancholy. It has no common chords because all the thirds give beats. The distinction between quintal triads and common chords is of the utmost importance to every musician, and more especially to composers. The idea induced by playing the piano and the organ that there are six common chords has led to laxity in composition and a perversion of taste.

<sup>&</sup>lt;sup>1</sup> See Glossarv.

#### THE FOUR PARENT SCALES.

The four parent scales are here represented merely for the sake of convenience as C modes. The notes of the quintal I call straight and denote by capitals. Let us now tune e from C without beats; we shall find that it is considerably flatter than the straight E. We call it low and denote it by a small letter. We now have the nucleus of two series, the straight and low. The scales of tertian music are built up from these two series. Where they meet in the tuning they obviously make a false fifth, the complement of which is a false fourth. In acoustics these intervals are known respectively as the grave fifth and acute fourth. Let us start from C and tune by fifths and fourths alternately from C to e, so as to bring the resulting scale within the compass of an octave. We thus get the pentatonic scales:—

C D e G A C'

The ties show the false intervals alluded to above. I play an Indian melody in the four pentatonic scales in succession, using a C pedal for the first two scales, and an a pedal for the last two, and emphasising the false fourth in each case. I give the two choruses of Mendelssohn's Open the heavens, showing how one begins with the false fourth and the other with the same interval narrowed down to the true fourth. The scales may now be completed by adding F and b.

Light Scale: C D e F G A b C' Open Scale: C D e F G a b C' Grave Scale: C d e F G a b C' Close Scale: C d e F  $\sigma$  a b C'

These scales contain three major tones, two minor tones, and two just semitones, the bounding notes of the semitones being a just fifth apart. The last property is a corollary of the fact that each scale has only one false fourth or fifth. They are the only scales possible with three or more common chords. The inescapable false fifth prevents any tertian scale from having six common chords.<sup>3</sup> The four scales are the inevitable

<sup>&</sup>lt;sup>2</sup> Inadvertently a hexatonic a mode tune was used for the last two. There is no good pentatonic melody in the a mode.

<sup>&</sup>lt;sup>3</sup> A scale has seven fifths, one diminished, one false, five true. The common chord requires a true fifth.

foundation of harmonic music. The false fifth completely defines each scale. The false fifth given, tuning by true fifths completes the scale. Thus D a means the Open Scale, the scale known in Europe as the just major. C g means the Close Scale, G d the Grave, and A e the Light. Take the Open Scale as an example. F and C are fixed as straight notes, and e and b fixed as low notes. Of the variables D (or d), G (or g), A (or a), D and a are given in the false fifth. G must be straight to connect D with the pitch-note C, without introducing additional false intervals. Remembering that the major chord runs straight, low, straight, and the minor chord low, straight, low, it is easy to pick out the common chords of the scales. The first and last have three, the second and third The ethos, indicated in a general way in the names chosen, is governed by the constitution which may be represented thus:—

Light Scale:

F (Ab) C e G b D (F#) A

Open Scale:

F a C e G b D

Grave Scale:

d F a C e G b

Close Scale: g (bb) d F a C e (g#)b

The ties above show major chords and the ties below minor chords. The gaps in the three-chord scales are sometimes filled chromatically as shown.

The irregular triads may now be considered. False major chords (C e g, G b d') are useless, and quintal major chords, such as F A C', g b d', are no better. Of the minor quintals, D F A is used in the light scale as an auxiliary to dominant harmony, but e g b is useless. D F a, and A C' e', the false minor triads, are used in the first inversion as added sixths, and have a somewhat poignant effect. The diminished triads, b D' F', and b d' F' differ in a marked way in flavour. 4

#### THE SCALES IN GREECE, INDIA AND EUROPE.

In Greece, the light scale, D mode, was the Ionian. As an example cf. the Epitaph to Seikilos. The E mode tetrachord of the open was known as the syntonon; in the Alexandria of Ptolemy's day it was the favourite hard diatonic tetrachord. The grave scale was the Aeolian. The close was the Dorian, the national scale of Greece. Its mode proper was the E

<sup>&</sup>lt;sup>4</sup> In their first inversion they may be compared respectively with (1) milk and water, (2) tea.

mode; its D mode was called Phrygian, its C mode Lydian, and B mode Mixolydian. Most of the extant music is in this scale. In the fifteen tonoi of the Greek notation, the syntonon took the G mode. In Europe it is mentally associated with the C mode, but unadulterated it makes a better G mode. There are two examples to be sung to-day, Bone Pastor and O Lux Beata Trinitas. I think Tone VIII which was the favourite of Pope Gregory was in this scale. The madhyama grāma of India, also exhibited as a G mode, was in this scale.

In India, the śadja grāma, exhibited as a D mode, was in the light scale. In modern India it is the favourite diatonic scale and is used in the C, D and G modes. The madhyama grāma, exhibited as a G mode, was in the open scale. Its favourite mode is now the E mode; it is also frequently sung in the C mode. If the D mode of the śadja grāma be turned into the C mode by adding the sharps of F and C, it passes into the grave scale. The same process applied to the madhyama grāma produces the close scale. The process was known as the introduction of the antara and kākali. I mention it to show that all four scales were known and differentiated by the ancient theorists in India. In modern India, the grave scale is common in the A mode, and is also used in the C mode. The close scale is not much in evidence. Indian music brings to the mind of the man-in-the-street the music of the snake-charmer. It is however in its classical form the only school of intonation in existence. Its survival is due to the use of the drone and the absence, until recent times, of popular education in music. The present generation of amateurs are apparently destined to kill it.

In Europe the practice of mixing scales seems to have started in earnest with the solmisation of Guido d'Arezzo. His names re, sol, la, suggest the inference that these notes are fixed in the scale. As a fact they are variables and always were variables. But there was no authority to explain and to caution. This led eventually to the twelve-note keyboard. The labour-saving keyboard has brought us to the point where we now are. There was a bright patch of refined intonation culminating in Beethoven. Then came an incursion from acoustics; among the further misconceptions that resulted may be counted the 'just major.' There are authorities still living who are of opinion that all our troubles would cease if someone with superhuman ingenuity could invent a keyboard

<sup>&</sup>lt;sup>5</sup> Intonation is "picked up" in Europe by many; but scales are not differentiated and there is no theory.

that would give the just major at twelve different pitches. Salvation, however, does not lie that way. The solution is to have a reasonably simple keyboard that will give a few keys replete with their variables, and to provide an electrical switch for purposes of transposition. In a large organ the wiring might provide for the following pitch-notes to govern the tuning of the sets of tone-producers operated through the switches by the manuals: b, C, e, F, Ab.6 The music would always be written as for the C set, and the actual pitch would be indicated thus: b switch, or Ab switch, etc., as the case might be. If the b switch were on, the white keys would play in b major, and the keys that gave Eb on the C switch would give D.

Beethoven is distinguished more than any other composer as far as my knowledge extends by the fact that he knew how to distinguish the four parent scales. The first theme of the Larghetto of his second symphony is in the light scale. climactic chord is the dominant ninth, and the quintal chord D, F, A is used as an approach to dominant harmony. The Pastoral Symphony begins in the open scale. One phrase containing the three primary triads in succession is like a scale-signature.7 The second theme of the same movement appears from the harmony to be in the light scale. Andante of the fifth symphony begins in the grave and changes to the open by a passage wonderful in its simplicity and effectiveness. In his Sonata Pathétique, first and last movements, the harmonies show that he had the close scale, A mode, in mind. The same scale informs and saddens the minor passages in Schubert's song Der Wanderer.

I am not dealing with mixed scales. Anyone desirous of learning how to add the chord dF a for example in the open, or a C' e' in the light, could not do better than consult Mozart. Such mixtures are out of place in plainsong.

If my facts and arguments are sound, current methods of harmonising plainsong must be wrong. Again it is indefensible to sing plainsong unaccompanied in the quintal, for it dissolves all melody into lugubrious futility. One can learn how to sing any mode by singing to a rich single pedal note, using one's judgment to avoid beats where beats are not

<sup>&</sup>lt;sup>6</sup> The only object of the Ab switch is to regularise the flat side chromatic chords of the flat keys, Db, Eb, Ab, Bb by providing the chords IIb, iv(b), VIb in correct intonation. Mere substitutes for these chords can be had from the C keyboard.

<sup>&</sup>lt;sup>7</sup> Bars 9 to 12.

wanted. As regards rhythm, it may be remembered that the "bondage of strict time" must have been a catchword of the opponents of reform centuries ago when the practice of descant started in the C and A modes. Definition in rhythm then became a necessity in those modes, but not in the other modes as no one knew how to deal with them. Somehow opposition was overcome and the staff notation eventuated as the most perfect instrument for recording any rhythm. Now that the musical world wishes to tackle the other modes, the same conservatism blocks the way, entrenched behind many more centuries of tradition. These are the arguments with which I support my venture in barring the music to be sung this afternoon.

I come now to the present state of musical intonation. I need not enumerate every defect I have come across. Most of them are patent to every listener who breaks the chains of habit and thinks. There are worse things than jazz. Jazz has a monotonous quintal background, irritating until one learns to ignore it, and, in some bands, tertian soloists. One has the same combination in the small orchestra and piano, or when a musician of feeling sings or plays on a flexible instrument to the accompaniment of the piano. The world has put up with the piano and instruments like it for an accompaniment for four hundred years because no better labour-saving instrument has been to hand. But there is no reason why any orchestra, or military or brass band should abandon the privilege of playing common chords without beats. The wise organist avoids playing accompanying chords on a rich stop. but what stop is richer than a multitude of singers? Why do they sing chords to the organ? 8 And why in the name of refinement are tertian orchestras made to play in combination with the quintal organ? A certain remedy for many of these symptoms is the study and teaching of intonation. If tertian music were better understood its much advertised difficulties would vanish. In course of time, music not amenable to tertian treatment owing to crudity, would be either scrapped or improved.

#### LIST OF ILLUSTRATIONS.

Sung and Accompanied on the Instrument with Special Tuning.

- 1. Ave, maris Stella (English Hymnal, No. 213). Light scale, D mode.
- 2. Jesu, dulcis memoria (E.H., No. 238). Light scale, D mode.

<sup>&</sup>lt;sup>8</sup> Church choirs, by singing in veiled notes, reduce their upper partials to a minimum, making the beats of the quintal less prominent.

- 3. Ecce! Panis Angelorum (E.H., No. 317). Light scale, G mode.
- 4. Bone Pastor (E.H., No. 317). Open scale, G mode.
- 5. O Lux beata (E.H., No. 164). Open scale, G mode.
- 6. O Pater sancte (E.H., No. 160). Close scale, E mode.
- 7. Pange lingua (E.H., No. 326). Grave scale, E mode.
- 8. Nocte surgentes (E.H., No. 165). Grave scale, C mode.
- 9. In manus tuas (E.H., No. 739). Grave scale, C mode.

#### GLOSSARY.

Added Sixth: The subdominant chord F a C' with the foreign note D' added. Sometimes the C' is omitted. (Not to be confused with D F A C', the dominant 'eleventh,' or d F a C', a harmonious diatonic seventh.)

Barring: using a regular musical time-measure.

Ethos: emotional flavour or content.

Interval: (1) semitones. In tertian music, which has three major tones only, the diatonic semitone is known as the just semitone (cents 112, compared with the tempered semitone, cents 100). In quintal music, to make room for five major tones, it is squeezed down to 90 cents, and has been called the leimma, diminished or quintal semitone.

(2) tones. The major tone (C D) measures 204 cents approximately; the minor tone (D e) 182. The ditone (C E), measures two tones or 408 compared with the major third (C e), 386.

Modes, naming of: the Greek names now in vogue are, without exception, complete misnomers. The modes are here named on the white key system. The D mode, for example, takes its tones and semitones in the order of the white keys from D to D'. Church Tones I and II contain a hotchpot of D modes and A modes. The former are with few exceptions Ionian; the latter Aeolian, in scale. In practice there can seldom be any doubt as to the correct intonation. One is guided by the final and dominant, and the flow of the melody.

Scale: (i) quintal: tuned by fifths from C;

(ii) tertian: tuned by fifths from C and its true major third e.

[These terms have already been put into circulation. Logically, their connotations should be exchanged, to put them into line with septimal and undecimal which are derived not from intervals (quint and tierce, or fifth and third), but from the harmonic series.]

- (iii) septimal: including intervals derived from the seventh partial tone, such as 21/20, 28/27. Example, the song La Paloma, first cadence, as sung by anyone intonationally expert.
- (iv) undecimal: including intervals derived from the eleventh partial tone, such as 12/11, 11/10.
- Soft: a term applied to septimal intervals from their effect, and used to distinguish them from the hard intervals of the quintal and tertian scales.

The following are intended to show the striking contrast between (1) the Light and Open (2) the Grave and Close scales. Even in temperament, these differences make themselves felt.

#### I. LIGHT SCALE, G mode.

Ecce! Panis Angelorum. (E.H. 317) Tone vii. Traditional ethos, 'angelicus.'







Pitch note Ab. Straight series: Ab-Eb-Bb-F and Db, low series: C-G-\dangle D. The figures 2 3 4 4 4 represent: 2, the just semitone; 3, the minor tone; 4, the major tone.

#### II. OPEN SCALE, G mode.

Bone Pastor. (E.H. 317). Tone viii. Traditional ethos, 'perfectus.'







Straight series:  $A\flat$ - $E\flat$ - $B\flat$  and  $D\flat$ . Low series F-C-G- $\sharp D$ . The figure 3 represents the minor tone.

#### III. GRAVE SCALE, E mode.

Pange lingua. (E.H. 326). Tone iii. Traditional ethos, 'mysticus.' Melody for men's voices. Soprano and Alto parts to be hummed.







Pitch note C. Straight series: C G and F. Low series: e, a, d and b, f#. The figures have the same meaning as before.

#### IV. CLOSE SCALE, E mode.

O Pater sancte. (E.H. 160). Tone iv. Traditional ethos, 'harmonicus.'







Pitch note C. Straight notes: C, F, Bb. Low notes: e a, d, g and b. This tune may also be regarded in Key F as the Grave Scale, B mode. Regarded as an E mode, its Bb is chromatic.

#### DISCUSSION.

The Chairman: When a man has spent as many years as Mr. Clements in studying a subject, we are glad that he should pay us the compliment of putting the result of his researches before this Association. I am not sure that he has gauged with accuracy the audience that he had to talk to. Many of us have delved no deeper into the mysteries of acoustics than the ordinary artist has in enquiring how paints are made.

We know that artists used to make their own paints, but it is doubtful whether musicians at any period understood much about acoustics. They obtained by instinct acoustical effects which were extraordinarily accurate. As Mr. Clements said, Beethoven had even used some of these scales we have heard about in certain works; but I should be prepared to wager a great deal that Beethoven did not know it, and I expect Mr. Clements would agree.

I am uncertain whether what has been put before us has been put on the ground that we have all been wrong and ought to modify our views, or on the ground of archæological interest, or on any other grounds. I have been interested all my life in acoustics, but mainly as a branch of mathematics. I have been puzzling as to how those scales would appear if expressed in vibration fractions or cents or any other acoustical terms. The words that I did recognise were clearly used in a different sense from that to which we are accustomed. For instance, the music Mr. Clements called 'pentatonic' was not in the least what we know as pentatonic. He used the term 'added sixth,' but the notes he pointed to did not make an added sixth in the harmonic sense. This is only the difficulty of establishing a common nomenclature, which after all is the difficulty in any branch of thought.

I have always been curious, and I have never known where to find out, what were the exact mathematical relationships of the notes of the modes. I have asked all sorts of people; I have studied some of those difficult mediæval Latin treatises: nobody could tell me. If Mr. Clements can tell me I shall look upon him as a lifelong benefactor.

Mr. Royle Shore: I had the pleasure of hearing Mr. Clements's views in connection with my lecture last year on The Vocal Accompaniment of Plainchant. I gathered he wished to point out the deficiencies of our equal temperament. Of course I have been brought up almost entirely on keyed instruments, and have never been able to appreciate those points which are simple to a violinist. Some of these points were discussed by Mr. Percy Scholes in the Musical Times last year. Special tunings are available to the violinist, as soloist, but what happens in an orchestra when violinists play with instruments which are of equal temperament? I could not myself feel much interest in his theories which were dependent upon the practical employment of unequal temperament or just intonation. I have felt it might be really a help if we had some demonstrations with regard to temperament on the

<sup>9</sup> Musical Times, vol. 76 (1935), p. 786, 840, 927, 1018, 1022.

lines of what Mr. Scholes wrote in the Musical Times. Many of us want to know about what happens, but until then, I must confess myself a convinced devotee of equal temperament, with the extraordinary developments harmonically speaking, from its employment, of which we are now the happy possessors.

Mr. CLEMENTS: Brass bands, military bands, and orchestras playing tutti, frequently render common chords without beats. Exactly in what way tuned wind instruments are made to vary the pitch of their notes is not a thing that can be learnt from books, or profitably be discussed. The fingers and breath work by feeling. I am told that a film was recently shown in which the method employed by a Scottish piper in playing a lament was strikingly demonstrated. I have seen a mouth organ's intonation manipulated, by shading certain notes with the hands. There are other ways also.

Sir James Swinburne: I think our difficulty is that we have had a lecture on an abstruse subject with a nomenclature which is strange to most of us. I doubt whether many in this room have been able to follow it at all.

As to the question of equal temperament and of just intonation, I have already offered a paper to the Association on that subject, and I hope when I read it to have an organ with one stop tuned in just intonation, and one in equal temperament, and one in mean tone. I hope then to answer some of the questions that have been raised.

The CHAIRMAN: Were your singers consciously and intentionally singing different notes from what they would have sung if you had played on the piano?

Mr. CLEMENTS: Yes. They have been rehearsing to this instrument. They know the major tone from the minor tone.

The CHAIRMAN: If you repeated an example but played it with them on the piano, would they dislike doing it so?

Mr. CLEMENTS: My experience is that the E mode seems better than the others on the piano. The D mode is worse than any. The piano sounds the quintal scale, which is known as equal temperament. The words "equal temperament" are used so much that one thinks there are two contrasted scales, a tempered scale and an untempered. My thesis is that the tempered scale is the quintal scale. There is no such thing as one just major. There are four, and those I think are inevitable.

Prof. Dent: Would Mr. Clements explain to us on what system his harmonium is tuned?

Mr. CLEMENTS: The object of the tuning is to secure as many keys as possible with all the variables: the D low and straight, the A low and straight, and the G if possible low and straight. I have as many keys as I can. On a big organ all the transposition desired may be made by an electrical device.

The CHAIRMAN: We ought to thank not only Mr. Clements for his paper, but also the singers for kindly coming to illustrate it.



The Motion of the Voice, h the fwnhs kinhsis, in the Theory of Ancient Music

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## IV. — The Motion of the Voice, ή της φωνης κίνησις, in the Theory of Ancient Music.

By Dr. CHARLES W. L. JOHNSON, YALE UNIVERSITY.

Many of the Greek treatises on music begin the development of the subject proper by describing and analyzing the changes in pitch which take place in the course of human utterance. The term applied to these changes was  $\dot{\eta}$   $\tau \hat{\eta} \hat{s}$   $\phi \omega \nu \hat{\eta} \hat{s}$   $\kappa i \nu \eta \sigma i \hat{s}$ . I propose in this paper to consider the nature of this 'motion,' the merits and defects of the ancient analysis, and the object of introducing the subject in treatises on musical theory, and then to show what light is thereby thrown for us upon the nature of ancient Greek music.

In almost every sound there is present to a sensible degree the property or quality of musical pitch. Pitch, regarded as a physical phenomenon, may be defined as regularity or periodicity in the vibrations of some suitable medium, such as air or water. Every set of regular or periodic vibrations constitutes what is technically called a simple sound, and the degree of the pitch of this sound depends upon the rapidity of the vibrations. A simple sound of this nature will seldom, if ever, occur in the ordinary course of events. Those sounds which appear to our senses the purest and simplest are in reality compound sounds in almost every instance. material objects which generate the vibrations in the air are usually of such a nature that not one set of vibrations only, but a number of sets at various rates is produced at one and the same time. Now the effect upon the ear of such a compound sound depends upon the interrelationship of the constituent pitches. If these pitches are not related to one another on certain numerical principles, the sound is a noise. If, on the other hand, a certain relationship exists between them, the sound is a musical sound. For a musical sound is a complex, formed by a series of simple sounds. Of these the lowest in pitch is generally the loudest. Superimposed upon this lowest pitch there will be found a group of fainter pitches, standing at certain definite distances from one another. These are the so-called overtones, and it is their presence which determines the 'quality' of the sound as a whole. Simple though the sound may seem to the ear, it is, in reality, as it were, a chord, in which all but one of the notes are faint. It is easy to see what a large number of combinations can be formed by varying the intensity of the several overtones, by omitting some and strengthening others. In this way physicists account for the great variety of quality observable in the tones of instruments and voices.

In a musical sound, then, of the constituent related pitches one is predominant. This gives the note its name and position. But in a noise, instead of order among the pitches we have confusion, instead of one predominant pitch, many pitches of considerable intensity.

Now evidently the line between musical sounds and noises cannot always be drawn with certainty. Many sounds, if not strictly musical in the technical sense, yet have one pitch of slightly greater intensity than any of the others. For example, a rap on a table has such a pitch, and many articles of wood, glass, and metal give sounds with recognizable pitches. Particularly is it true of all vocal utterances that a height or position on the scale of acuteness and graveness can be assigned to them. This is the case not only with such inarticulate sounds as coughing and laughing, but to a special degree with the sounds of articulate speech. This fact then must be emphasized. All speech, spoken as well as sung, is characterized by the presence of pitch.

Now the tones of the voice in singing and in ordinary conversation are obviously different. In what does the difference consist?

In the first place it would seem that the difference is due very largely to the different degree of clearness with which the predominant pitch is brought out. The loudness of the lowest of the constituent pitches is made greater in singing than in speaking. A second difference, but little less important, is due to the different manner in which the pitch changes from time to time, and it is these changes which the ancient treatises on music consider under the term  $\dot{\eta}$   $\tau \dot{\eta} s$   $\phi \omega \nu \dot{\eta} s$   $\kappa \dot{\nu} \nu \eta \sigma \iota s$ , the primary object being to differentiate the speaking and the singing voice.

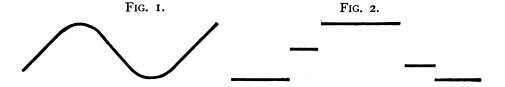
Aristoxenus, if we may trust his own statement, was the first to treat of this subject of the motion of the voice in a satisfactory way. At any rate his method is more or less closely followed by a number of subsequent writers. are Aristides Quintilianus, Pseudo-Euclid (the author of the Introductio Harmonica), and Gaudentius. Other writers on the theory of music employ another method of effecting the differentiation of the two kinds of utterance. Chief among these is the geographer and astronomer, Claudius Ptolemy. His method is to analyze and classify sounds so as to show the position which musical sounds occupy among sounds in But the classification of Aristoxenus is not a classification of sounds at all, but of the ways in which a certain property found in certain sounds, though not in all, may behave during the existence of the sounds in question. property is, of course, pitch, and the sounds are the articulate sounds of the human voice. If the tones of musical instruments are sometimes included in the term  $\phi\omega\nu\dot{\eta}$  (Aristoxenus has the phrase  $\phi\omega\nu\dot{\eta}$   $\partial\rho\gamma\alpha\nu\iota\kappa\dot{\eta}$   $\tau\epsilon$   $\kappa\alpha\dot{\iota}$   $\dot{\alpha}\nu\theta\rho\omega\pi\iota\kappa\dot{\eta}$ , it is by analogy with the tones of the human voice.

Now pitch can vary in one respect only, that is, in respect to its degree of acuteness, or graveness. There is only one dimension, and this is indicated by the metaphorical use of the terms 'high' and 'low' as applied to pitch. If, then, we desire to indicate graphically on a plane surface the nature of any pitch changes under consideration, we can do so by supposing variation in pitch to take place vertically, and by combining with this motion a horizontal motion, as from left to right, to represent the passage of time.

By the term  $\kappa i\nu \eta \sigma is \tau \eta s \phi \omega \nu \eta s$  Aristoxenus means the movement of the pitch of the voice from high to low and vice versa, and by the term  $\sigma \tau a \sigma is$  the absence of any such

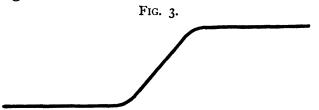
motion in the pitch. Another term for the latter conception is  $\eta \rho \epsilon \mu i a \phi \omega \nu \eta s$ . Of the movement there are two forms, the continuous, συνεχής, and the intervallar, διαστηματική. Aristoxenus, Harmonica, I. § 26, p. 8 Meib.: "In the continuous movement the voice appears to the senses to traverse a certain space in such a way that it rests nowhere, not even, so far as our conception of the sensation goes, at the bounds, but is borne along continuously until the sound ceases. the other movement, which we call intervallar, the voice appears to move in a contrary manner. In its course it rests on one pitch and then again on another, and doing so continually  $(\sigma v \nu \epsilon \chi \hat{\omega} s)$ , — I mean continually in point of time, passing over the spaces included by the pitches, but resting on the pitches themselves and sounding these alone, it is said to sing  $(\mu \epsilon \lambda \varphi \delta \epsilon i \nu)$ , and to move in the intervallar manner." And a little further on (§ 27): "For, in general, when the voice moves in such a way that it seems to the ear to rest nowhere, we call the movement continuous. But when, after seeming to rest at a place, the voice then appears to traverse a certain space, and having done this seems to rest again on another pitch and continually keeps on doing this alternately, we call such a movement intervallar."

On a chart of the nature indicated above continuous motion is represented by oblique lines or by wavy lines of which no part is horizontal, except instantaneously; intervallar motion is shown by a series of horizontal lines, disconnected, with no part of one over another. Thus:



At this point it seems best to remark that the musical phenomenon denoted by the term *portamento* is evidently a combination of these two sorts of motion: first a steady sound without variation in pitch, then a rapid passage from this original height, upward or downward as the case may

be, to a certain new height, and finally again a steady sound at the new height. This process is represented by the following figure:



It appears, then, that in the continuous style of motion not only is the variation in pitch continuous, but the pitch never ceases to vary until the sound stops, while in the intervallar style change takes place by leaps and in no other way. In the one case there is never steadiness in the pitch, even for a moment; in the other there is a series of steady pitches.

In what sense, then, can one speak of motion in a case where, as in the intervallar motion of Aristoxenus, the moving object takes no positions intermediate to the initial and final positions? The change from one pitch to another is in the nature of a transformation rather than a transference. Is not the sense of identity of sound lost in this change from one degree of pitch to another? Why should we not call the new pitch a new sound? For, if the second pitch began before the first had ended, we should be compelled to call the two pitches two sounds.

In regard to these difficulties, we must remember in the first place that the classification of Aristoxenus does not deal with separate sounds, but with the whole body of sound proceeding from a single source. It was natural to consider one voice alone, when part-singing was practically unknown. In the second place, the words  $\kappa\iota\nu\epsilon\omega$  and  $\kappa\iota\nu\eta\sigma\iota$ s seem to have had a signification broader than that of physical motion, whether used literally or metaphorically. This is clear from a passage in the *Theaetetus*. Socrates, in discussing the doctrine of Heraclitus that all things are in motion, asks (*Theaet*. 181 D) if there are not two kinds of  $\kappa\iota\nu\eta\sigma\iota$ s. One is (Jowett's translation) "when a thing changes from one

place to another, or goes round in the same place." The other is "when a thing grows old, or becomes black from being white, or hard from being soft, or undergoes any other change, while remaining in the same place. . . There are then these two kinds of motion, 'change,' and 'motion in place' ( $\dot{\alpha}\lambda\lambda o l\omega\sigma\iota s$  and  $\pi\epsilon\rho\iota\phi o\rho\dot{\alpha}$ )."  $Kl\nu\eta\sigma\iota s$ , it would then seem, has a broader meaning than simply physical motion, namely 'change,' whether of position or of condition and nature. It covers transformation as well as transference. In this view  $\kappa l\nu\eta\sigma\iota s$   $\delta\iota a\sigma\tau\eta\mu a\tau\iota\kappa\dot{\eta}$  can be regarded as  $\kappa l\nu\eta\sigma\iota s$  in this broadest sense.

The identification of κίνησις συνεχής with conversational speech and of κίνησις διαστηματική with the singing voice is made by Aristoxenus in the following terms (Harm. I. § 28, p. 8. M.): "Now the continuous movement is, we assert, the movement of conversational speech (λογικήν είναι), for when we converse, the voice moves through a space in such a manner as to seem to rest nowhere. In the other movement, which we call intervallar, the contrary process takes place. For the voice seems to rest [at various pitches], and all say of a man who seems to do this, that he no longer speaks. but sings. Therefore in conversing we avoid having the voice rest unless we are forced at times by reason of emotion to resort to this style of movement [we make the same criticism when we say of a person that he speaks or reads in a sing-song voice]; but in singing we do the reverse, for we avoid the continuous and strive to make the voice rest as much as possible. For the more we make each of the sounds one and stationary and the same, so much the more accurate does the singing seem to the senses. It is fairly plain from the above that of the two movements of the voice in respect to space, the continuous belongs to conversational speech, the intervallar to song."

Such is the scheme of pitch-variations as we have it in Aristoxenus. In spite of its faults it has unquestionably considerable value in that it is based on the evident difference in the manner in which pitch affects human utterance as spoken and as sung.

Perhaps Ptolemy felt the objections which may be brought against the Aristoxenean classification. At any rate his classification is a classification not of kinds of voice-movements, but of kinds of sounds. According to him sounds are either unchangeable in regard to their pitch, ἰσότονοι, or changeable, ἀνισότονοι. The latter in turn are continuous, συνεχεῖς, or discrete, διωρισμένοι.

Thus: 
$$\psi \acute{o} \phi o i \begin{cases} i \sigma \acute{o} τονοι \\ i \sigma \acute{o} τονοι \end{cases} \begin{cases} \sigma v v ε χε \hat{i} s \\ \delta \iota ω \rho \iota \sigma \mu \acute{e} ν ο \iota = \phi \theta \acute{o} γ γ ο \iota. \end{cases}$$

Aristides Quintilianus makes a decided improvement on Aristoxenus' treatment of the  $\kappa i\nu \eta \sigma \iota s$ . First he distinguishes two classes of  $\kappa i\nu \eta \sigma \iota s$ ,  $\kappa i\nu \eta \sigma \iota s$   $\dot{a}\pi \lambda \hat{\eta}$  and  $\kappa i\nu \eta \sigma \iota s$   $o\dot{\nu}\chi \dot{a}\pi \lambda \hat{\eta}$ . Of the latter there are three species,  $\sigma \nu \nu \epsilon \chi \dot{\eta} s$ ,  $\delta \iota a \sigma \tau \eta - \mu a \tau \iota \kappa \dot{\eta}$ , and  $\mu \dot{\epsilon} \sigma \eta$ .

κίνησις 
$$\left\{ egin{array}{l} \dot{lpha}\pi\lambda\hat{\eta} \ & \sigma$$
υνεχής  $& \mu$ έση  $& \delta$ ιαστηματική.

The first two, continuous motion and intervallar motion, are so described as to leave no doubt that they correspond exactly to the motions so named by Aristoxenus. In regard to the 'intermediate' motion, it would appear that it is composed of both the other species ( $\hat{\epsilon}\xi$   $\hat{a}\mu\phi\hat{o}\hat{\nu}$   $\sigma\nu\gamma\kappa\epsilon\iota\mu\acute{e}\nu\eta$ ), and we are further informed that it is used when we read poetry ( $\mu\acute{e}\sigma\eta$   $\delta\grave{e}$ ,  $\hat{\eta}$   $\tau\grave{a}s$   $\tau\grave{\omega}\nu$   $\pio\iota\eta\mu\acute{a}\tau\omega\nu$   $\grave{a}\nu a\gamma\nu\acute{\omega}\sigma\epsilon\iota s$   $\pio\iotao\acute{\nu}\mu\epsilon\theta a$ ). Referring back to our figures, in which we represented the two Aristoxenean motions, let us combine their characteristics. The

result must show, on the one hand, pitch-variation taking place while the sound is actually being produced, on the other, sounds of a steady pitch. The combination is precisely that which is effected by the phenomenon of portamento. We may conclude, therefore, that κίνησις μέση, that form of pitch-movement which accompanies the recitation of poetry, as observed by Aristides, consists not only of a musical intonation of the syllables at various degrees of pitch, but also of glides in pitch from degree to degree. Such a style of utterance is more musical than conversational speech in respect to the employment in it of sounds whose pitch is constant, or steady, and more conversational than music proper in respect to the free use of fluctuating pitch. Without running into the danger of drawing conclusions unwarranted by the facts, we may assume that the element of pitch was brought out much more clearly in the kind of motion we are considering than in ordinary conversational speech; and further, that, if the pitch of the voice rested, remained steady, at certain degrees, it must have done so during an appreciable interval of time, and if so, the metrical quantity of the syllables must have been made more evident than is possible in the case of the spoken sentence.

Coördinate with κίνησις μέση in Aristides' scheme were κίνησις συνεχής and κίνησις διαστηματική. These three cover, and more than cover, the whole of the Aristoxenean κίνησις  $\tau \hat{\eta} s \phi \omega \nu \hat{\eta} s$  or pitch-variations in general. In Aristides they form a class,  $\kappa i \nu \eta \sigma \iota s$  où  $\chi \dot{a} \pi \lambda \hat{\eta}$ , which is coördinate to  $\kappa i \nu \eta \sigma \iota s$ The meaning of the latter term is made plain from the statement at p. 9 M.:  $\pi \hat{a} \sigma a \mu \hat{\epsilon} \nu o \hat{\nu} \nu \delta \pi \lambda \hat{\eta} \kappa \hat{\nu} \nu \eta \sigma \nu \sigma \nu \eta s$ , That is,  $\delta \pi \lambda \hat{\eta} \kappa i \nu \eta \sigma \iota s$  is simply a musical sound, in which there is by definition no variation in pitch. The movement then is of another sort, to wit, movement in time, which is horizontal motion on our charts. In the other class. κίνησις οὐχ ἀπλη, two kinds of motions are combined to form a compound motion; variation in pitch is added to progression in time. A comparison between this classification and that of Ptolemy will show a certain similarity. In both it would seem to be a fault that the elements which constitute one of the lower classes should also find a place in a higher class.

A further extension of the classification of the kinds of κίνησις was sometimes made. Gaudentius subdivides κίνησις διαστηματική into two kinds, ἐμμελής and ἐκμελής, and makes a corresponding subdivision of διαστήματα into διαστήματα  $\dot{\epsilon}\mu\mu\epsilon\lambda\hat{\eta}$  and  $\delta\iota a\sigma\tau\hat{\eta}\mu a\tau a$   $\dot{\epsilon}\kappa\mu\epsilon\lambda\hat{\eta}$ . These terms mean respectively 'usable in music' and 'unusable in music,' and refer, of course, to the size of the intervals. The same distinction is made by Bacchius Senior, but the term  $\pi \epsilon \zeta \delta s$  is used instead of  $\epsilon \kappa \mu \epsilon \lambda \dot{\eta} s$ , and it is musical sounds, not intervals, which are distinguished. When applied to sounds and not to intervals all these terms must be understood to involve a tacit reference to their relationship to other sounds. Intro-"How many kinds of musical-sounds ductio, p. 16 M.  $(\phi\theta\dot{\phi}\gamma\gamma\sigma\iota)$  do we say that there are?"—"Two. One kind we call  $\epsilon \mu \mu \epsilon \lambda \epsilon i s$ , the other  $\pi \epsilon \zeta o i$ ."

"What kind of musical-sounds are  $\epsilon \mu \mu \epsilon \lambda \epsilon i s$ ?"—"Those which people use in singing and in playing instruments..."

"What kind of musical-sounds are  $\pi \epsilon \zeta o i$ ?" — "Those which orators use and in which we talk  $(\lambda a \lambda o \hat{\nu} \mu \epsilon \nu)$  to one another.  $E \mu \mu \epsilon \lambda \epsilon \hat{i} s \phi \theta \delta \gamma \gamma o \iota$  have definite  $(\delta \rho \iota \sigma \mu \epsilon \nu a)$  intervals, the  $\pi \epsilon \zeta o \iota$  indefinite  $(\delta \delta \rho \iota \sigma \tau a)$ ."

Now a  $\phi\theta\dot{\phi}\gamma\gamma\sigma$  is always defined as a sound which has a steady pitch (hence I translate it by 'musical-sound'), and the word is so defined by Gaudentius. For that reason, if  $\lambda a\lambda\epsilon\hat{\imath}\nu$  means ordinary conversation, the glides which are characteristic of conversational speech are ignored. Even if they are admitted, our author would seem to differ from Aristoxenus in allowing the voice during 'continuous motion' to rest at pitches long enough to permit one to speak of intervals.

We have seen what is meant by the term  $\dot{\eta}$   $\tau \eta s$   $\phi \omega \nu \eta s$   $\kappa i \nu \eta \sigma i s$ . The phenomenon of pitch-variation in both the sung and the spoken sentence is a most natural one, and the two styles of variation characterize and distinguish the musical and non-musical utterance of a modern language, no less, of course, than that of an ancient language. Now a treatise on the theory of music may very properly begin with a

definition of the unit or element of music, the musical sound. So modern treatises usually define the musical sound as distinguished from the non-musical sound. So also does the Aristoxenean analysis of the  $\kappa i\nu \eta \sigma \iota s$   $\tau \hat{\eta} s$   $\phi \omega \nu \hat{\eta} s$  serve to fulfil this purpose. But it does much more than this. It defines not only the nature of the sounds which constitute music, and that too much more fully than seems necessary, but also the nature of the pitch-element in the spoken sentence. Why was it that the analysis of  $\kappa i\nu \eta \sigma \iota s$  was not inappropriate in a Greek treatise on the theory of music?

To this question one answer suggests itself immediately. The Greek language, as is well known, had a more highly developed system of high and low pitches for spoken words than have modern languages. Each word seems to have had a more or less fixed scheme of intonation. This is evidenced by the system of written accents. As a result, in every Greek sentence there is involved a definite form for the successive rises and falls of pitch, in which it is very likely that the amount of variation from the mean pitch of the speaker's voice was by no means definite, but the sequence of acute and grave was fixed and not subject to personal caprice. This variation of pitch, which took place of course in the 'continuous' style of motion, Aristoxenus calls λογωδές τι  $\mu \in \lambda$ os. Says he (§ 42): "For we often indeed speak of a certain conversational melody, namely, that which results from the accents of the words; for it is natural to raise and lower the pitch in conversation." Familiarity with this kind of melody would lead to an effort to distinguish it from melody proper. If, as we suppose, the spoken utterance of ancient Greek was of a quasi-musical nature, it was natural to contrast the melodic feature of the one form of utterance with that of the other.

Another consideration which I would advance by way of explanation for the use of the  $\kappa i\nu \eta \sigma \iota s$  in the treatises concerns a characteristic of ancient music about as foreign to modern music as one can well imagine. I refer to the existence of the different *genera*, to which there is nothing comparable in modern music.

The nature of the Greek scales must first be briefly indicated. The earliest scale seems to have been the tetrachord, or system of four notes, in which the extremes stood at the consonant distance of a perfect Fourth. Both the number of notes is small and the compass is narrow. By the time of Terpander the scale had expanded to seven notes, which probably formed a double tetrachord, the middle note serving as upper end of one tetrachord and lower end of the other. Terpander made some change in this heptachord of which the nature is not perfectly clear. It would appear, however, that he increased the compass to the full Octave interval, without increasing the number of notes. There seem to have been objections to abandoning the traditional number seven. Timotheus, the poet and musician, met with strong opposition when he introduced the innovation of using eleven and twelve strings on his cithara. The octave scale of eight notes comes into use soon after the heptachord. The scale was formed of two tetrachords plus the interval of a whole Tone. When the Tone was at the end of a scale, the two tetrachords were contiguous and were called συνημμένα (conjunct); when the Tone was in the middle and separated the tetrachords, it was called the Disjunctive Tone, and the tetrachords were διεζευγμένα (disjunct).

Soon after the time of Aristoxenus, cir. 330 (who does not allude to a longer scale than the octachord), and apparently before Euclid, the mathematician (if the *Sectio Canonis* is his), the scale had developed through additions to both ends until its compass was two octaves and the number of notes fifteen. This was the so-called Perfect System. Still further expansion followed. The notation provides for more than three octaves of notes.

Now in all stages of development, it is not the Octave, but the Fourth, which is made the basis of the Greek scale. The tetrachord retains the important place which it had according to tradition in primitive music. Every scale was regarded as consisting of a series of conjunct and disjunct tetrachords. This gave to a certain number of notes a prominent position as the bounding notes of tetrachords. Given the pitch of any one of them, that of all the others stood in a fixed relation to the given pitch—that is to say, the intervals separating any two of these notes was either a Fourth, a Fifth (that is, a Fourth and a whole Tone), or the sum of these, an Octave, or an Octave combined with one of the others. Therefore the intonation of these notes, depending as it did on consonant intervals, was fixed, relatively one to another, by nature, as it were. In ancient theory they were called 'standing notes' ( $\phi\theta\dot{\phi}\gamma\gamma\omega$   $\dot{\epsilon}\sigma\tau\dot{\omega}\tau\dot{\epsilon}s$ ).

There remain for consideration the notes which come between the fixed or standing notes. These occurred in couples and divided the interval of the Fourth into three smaller intervals. Now the peculiar feature in Greek music referred to is that the intonation or position in pitch of these intermediate notes was of a most uncertain nature. style of melody these notes would stand at such and such distances from the fixed bounds of the tetrachord; in another style at quite other distances. The ancient theorists, by using the relative lengths of the strings required for producing the various sounds, measured, with quite sufficient accuracy for the purpose, the width of the intervals which separated these notes; and so were able to classify the various kinds of intervallar succession. In this way the so-called genera came into existence. These were three in number — the diatonic genus, the chromatic genus (by no means to be confounded with the chromatic scale of modern music), and the enharmonic genus. Roughly speaking, we may define the diatonic genus as that in which the succession of intervals was Semitone, Tone, Tone; the chromatic as Semitone, Semitone, and (a larger interval) Tone-and-a-half: and the enharmonic as Quarter-tone, Quarter-tone, and Ditone (i.e. two whole Tones). But this is by no means the end of the matter. Species of the genera were recognized. These were the chroae or 'colors,' in which the succession of intervals was slightly different from that of the more normal varieties. An example will suffice to show their nature. There were, according to Aristoxenus, Harm. I. § 54, p. 50 M., three species of the chromatic of the following

nature:  $\tau \delta$  τονιαῖον χρῶμα, consisting of two Semitones and a Trihemitonion;  $\tau \delta$  ἡμιόλιον χρῶμα, of two intervals each three-quarters of a Semitone in size, together with an interval equal to three and a half Semitones; and, third,  $\tau \delta$  μαλακὸν χρῶμα, of two intervals each two-thirds of a Semitone in size, together with an interval equal to three and two-thirds Semitones. For these calculations it is necessary to consider differences in pitch of only a twelfth of a Semitone in extent.

There is still other evidence in abundance that the varieties of intervallar succession within the compass of the tetrachord, the Fourth, were very numerous, and that too important. Other theorists give other intervals for species of the same names as the Aristoxenean species. In many cases we may doubtless assume that errors in the measurements are the cause of the discrepancies. In other cases it is open for us to suppose that there was a difference of usage in regard to any particular genus from time to time. But in general it must be true that there were in actual use at any given period at least as many kinds of tetrachords as we find recorded in the works of any single trustworthy authority, like Aristoxenus, for example. It must be that the different genera and chroae really existed. Many students of Greek music, possibly most of them, find it incredible that the minute differences between the various kinds of tetrachords had any other than a theoretical existence. But is it not much more incredible that all the ancient theorists either imagined differences which did not exist or falsified their report of the state of affairs? We must not try to make the music of the ancients conform to modern ideas on the sub-Modern music has had a rapid and wonderful development. The most important feature in this development is the use of the principle of simultaneous harmony. But the artistic effects to be gained by sounding two or more notes together were not appreciated by the ancients, except in a rudimentary way. Now in the case of the primary consonances, the Octave, Fifth, and Fourth, it is important for obvious reasons that the interval should be accurately tuned, as well for use in melody as in harmony. But there is no

reason in ancient music why the dissonant intervals should be so tuned. Even in modern music in the case of intervals like the Major and Minor Thirds and Sixths, intervals which are now regarded as consonant, there may be considerable inaccuracy in the intonation of the notes without causing the effect to be disagreeable, not only when they are successive notes, but also, to a certain extent, when they are simultaneous notes. Ancient music, unaffected by such considerations of harmony, was free. And this is the reason that we find such a surprising variety of intonations for all notes but the few so-called standing notes. As distinguished from these, the variable notes were called in ancient theory 'moving notes' ( $\phi\theta\dot{\phi}\gamma\gamma oi$  κινούμενοι).

The state of affairs then in regard to the pitch of many of the notes was one of great flexibility. To us who are habituated to fixity in the intonation of the notes, this seems most unnatural. But the non-harmonic music of many semi-civilized and barbarous races to-day is proof of the possibility of this sort of thing.

So, while fixity is in modern music both a necessity and a second nature, in ancient music mobility is the rule and the distinguishing feature. Under such circumstances, it is not surprising that this side of melody should present itself to the ancient theorists as a matter of great importance. The limits within which a given note of the movable kind might 'move' were carefully laid down, and the distance between a note's highest possible pitch and its lowest was called its space or region  $(\tau \delta \pi o s)$ . Moving of this sort is not, to be sure, moving in quite the same sense as the moving which seems to take place in melody, for we are not to understand that more than one genus was used at once, but we do know that there were frequent shiftings from genus to genus within the piece of music, and such changes of pitch cannot fail to impress one with the idea of motion.

The importance of the  $\kappa i\nu \eta \sigma v$  in the theory of ancient music is then due to its connection first with the accentuation of the Greek language, and secondly with the general question of the intonation of the notes in Greek music.



Synesis in Aristoxenian Theory

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#### SYNESIS IN ARISTOXENIAN THEORY

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in memoriam Miriam W. Hassell

Music must be conceived by human beings. Although the sounds of music derive immediately from the vibrating string or the column of air, the ordering of these sounds into a melody which moves the listener is a function of the human mind. Conceived by the mind, music speaks to other minds, which recognize in it not merely the sounds of melody but representations of human feelings. And although one can analyze precisely the physical properties of sound and interval or dissect meticulously the anatomy of melody, the affective power of music eludes objective representation. In fact, the more closely music is assimilated to its physical form, the farther is one removed from its source and energy. The recognition of this fact is a fundamental achievement of Aristoxenus, the fourth century B.C. musical theorist. His epochal contribution to the history of ideas consists in a theory of music based on the notion  $\dot{\eta}$   $\tau \hat{\eta} s$   $\mu o \nu \sigma \iota \kappa \hat{\eta} s$   $\xi \dot{\nu} \nu \epsilon \sigma \iota s$ , construed here to be "musical intuition" or "competence," i.e. an inherent mental capacity comprising one's implicit musical knowledge. Formulated

1 LSJ list σύνεσις (ξύνεσις) as being derived by Plato Crat. 412A from συνιέναι (σύνειμι), come together; they give the received etymology, however, as συνίημι, perceive, apprehend. Apart from its unique occurrence in Hom. Od. 10.515, where it denotes "a union of the two loud-sounding rivers," σύνεσις appears regularly with reference to some faculty of the mind; thus, Arist. EN 1143A13 (τὸ μανθάνειν λέγεται ξυνιέασι); Plato Crat. 411A (φρόνησίς τε καὶ ξύνεσις); Eur. Her. 655 (ξύνεσις καὶ σοφία); Pind. Nem. 7.60 (σύνεσιν . . . φρενῶν); Thuc. 1.75 (γνώμης ξυνέσεως); Arist. de An. 410B3 (ξύνεσις as opposed to ἄγνοια). Its appearance with an objective genitive denoting intelligence in a thing, sagacity in respect to something, as in Plato Crat. 412C (τῆ τοῦ δικαίου συνέσει), is exemplified in Aristoxenus' construction ἡ τῆς μουσικῆς ξύνεσις, but the latter citation is not included in LSJ. The gloss mother-wit or native sagacity for σύνεσις as, for example, in Thuc. 1.138 (οἰκεία ξυνέσει), is a most telling instance of its reference to an inherent knowledge, the sense in which it is used, I believe, by Aristoxenus. Of the ten occurrences of ξύνεσις and ξυνίημι in the Harmonics, only two are used by

on this notion, his theory, transmitted to us in the fragmentary document known as *Harmonics*,<sup>2</sup> represents more than a "descriptive anatomy"<sup>3</sup> of ancient Greek music. It is, beyond this, I believe, an attempt to account for the mental process responsible for the creation

Aristoxenus in the general sense of "understanding" or "comprehension." H. S. Macran, The Harmonics of Aristoxenus (Oxford 1902), accordingly translates Harm. 3 (p. 167): "Furthermore, it is essential to a clear comprehension of these points . . ." [είς τὴν τούτων ξύνεσιν] and Harm. 16 (p. 176): "When it [a definition] puts him in the way of understanding [είς τὸ ξυνιέναι] the thing defined." The other instances of Eúveous in Aristoxenus' text clearly refer to some kind of mental activity that is more significant than the English words "understanding" and "comprehension" suggest. That Macran was aware of a complex meaning is apparent from his variety of translations, as, for example: "cognition" (p. 189), "apprehension" (p. 193), "intellectual apprehension" (p. 195), "intellectual process" (p. 195). In this paper I argue that synesis for Aristoxenus is musical intuition. Aristoxenus states at one point (Harm. 38) that "τὸ ξυνιέναι of melodies consists in the ability to follow with the ear and intellect what is taking place with respect to its every distinction" (my translation). This implies more than mere recognition or superficial understanding of melodic lines; it suggests, rather, a total musical competence. This construction is derived from the notion "linguistic competence," for which see Noam Chomsky, Aspects of the Theory of Syntax (MIT Press, Cambridge 1965) 4. The orientation of this paper is in many important respects influenced by the work of Chomsky and modern linguistics.

The following abbreviations are used: Jan = C. von Jan, Musici scriptores Graeci (Leipzig 1895); D = L. Deubner, Iamblichus, De vita Pythagorica (Leipzig 1937); Düring = I. Düring, Ptolemy, Harmonica (Göteborg 1930); Dupuis = J. Dupuis, Theon of Smyrna, Expositio rerum mathematicarum ad legendum Platonem utilium (Paris 1892); Hoche = R. Hoche, Nicomachus, Introductionis arithmeticae libri II (Leipzig, 1865); Winnington-Ingram = R. P. Winnington-Ingram, Aristides Quintilianus, De musica (Leipzig 1963).

<sup>2</sup> The treatise has come down to us in three books designated in most of the MSS by the title, "The Harmonic Elements of Aristoxenus." That it has been compiled from as many as three or four works of the author has been suggested by scholars on the basis of various inconsistencies, repetitions and omissions in its treatment of the subject. The first book defines the scope of harmonics and its subsidiary subjects, the second redefines it, establishing the principles (archai) from which its laws are deduced, the third comprises theorems and proofs in the manner of Euclid's *Elements*, breaking off abruptly in the course of examining the species of a fourth. Missing elements of the theory may be deduced from material contained in treatises written centuries later as, for example, Cleonides, Isagogê Harmonikê and Gaudentius, Harmonikê Isagogê, which purport to transmit Aristoxenian doctrine. It is not certain, however, that these writers have handed down the theory without corruption. Cf. R. P. Winnington-Ingram, Mode in Ancient Greek Music (Cambridge 1936) 11. Scholarly opinion on the problem of the work's lack of unity and its probable compilation from a multiplicity of treatises is discussed by Macran (above, note 1) 89-92. More recently the question has been given penetrating analysis by R. da Rios, Aristoxeni Elementa Harmonica (Rome 1954) who, in the "Prolegomena" (cvii-cxvii), presents her own well considered throughts (cxvi-cxvii).

<sup>3</sup> I. Henderson, "Ancient Greek Music," The New Oxford History of Music 1 (Ancient and Oriental Music), ed. E. Wellesz (London 1957) 343.

and comprehension of music. The importance of Aristoxenus' theory resides then not primarily in its description of musical phenomena, however crucial for our knowledge of Greek music this may be, but, more fundamentally, in its delineation of the possibilities for such phenomena to occur.

The mental process by which music is conceptualized and translated into sound and performance is represented by Aristoxenus in the a priori notion of musical *synesis* or intuition. In his words (*Harm*. 41):4

for, as a fact, the ultimate factor in every visible activity is the intellectual process [synesis]. For this latter is the presiding and determining principle; and as for the hands, voice, mouth or breath—it is an error to suppose that they are very much more than inanimate instruments. And if this intellectual activity [synesis] is something hidden deep down in the soul, and is not palpable or apparent to the ordinary man, as the operation of the hand and the like are apparent, we must not on that account alter our views. We shall be sure to miss the truth unless we place the supreme and ultimate, not in the thing determined, but in the activity that determines.

The activity that determines is conceived by Aristoxenus to be  $\hat{\eta} \tau \hat{\eta} s$   $\mu o \nu \sigma \iota \kappa \hat{\eta} s \xi \acute{\nu} \iota \epsilon \sigma \iota s$  (Harm. 33) or musical intuition.

In effect, Aristoxenus' theory of music may be regarded as his answer to the question, What is music? The nature of music, whose deeper meaning the probings of science and empiricism were unable to reveal, was understood by Aristoxenus to be an activity of the human mind. For him, musical thought was a reality, the ultimate cause of the musical art that, objectified through performance, could be understood by other minds. In this respect, Aristoxenus' theory of music may be enlisted as evidence for Aristotle's dictum (EN 1140A12-14): "All art is concerned with creation, and to practice an art is to contemplate how to create something that admits of existence or non-existence, and the efficient cause of which is in the maker but not in the thing made." For Aristoxenus the efficient cause of music is a mental faculty, termed by him synesis.

The method adopted by Aristoxenus for determining the nature of music was to abstract from musical activity a cognitive system in which

<sup>4</sup> English translations are those of Macran (above, note 1).

the properties of musical thought inherent in the notion of intuition are represented. Although he acknowledged that this faculty of intuition was not itself observable in any direct way, that it was, in fact, "something hidden deep down in the soul," he nonetheless considered it to underly all observed musical activity. In his view, any system that attempted to account for musical phenomena in terms of mathematical theory or empirical researches based on the mechanistic function of instruments was destined to become extraneous to the subject or quite at variance with the phenomena (Harm. 32). Since neither pure science nor empirical method could approach the reality of musical intuition, Aristoxenus extended his theory beyond the mere physiology of sound and instruments, arguing that the limited focus of such endeavors could not account for the normal use of music, in that they could not account for musical thought itself. Thus, it became necessary for him to invoke a new principle, one whose essence was a form of mental activity. For this reason his system of Harmonics is qualitatively different from anything that was formulated in terms of mathematical acoustics or empirical research.

Ι

The epochal discovery which ancient authorities unanimously attribute to Pythagoras of Samos,<sup>5</sup> namely that musical notes depend on numerical proportions, was animated by the desire to convert sense distinctions of pitch and interval into observable form. In striving to establish the physical and mathematical properties of sound, Pythagoras supplanted the unobservable testimony of the ear by something concrete and susceptible of measurement. Music was shown by Pythagoras to be ruled by number; it was to have, as it were, an existence external to its cognition, an existence from which a mathematical system of ratios could be extrapolated and studied independently. The fabulous account of Pythagoras' experiment with the

<sup>&</sup>lt;sup>5</sup> Cf. A. Delatte, Études sur la littérature pythagoricienne (Paris 1915) 259. The discovery of the laws of acoustics was attributed to Pythagoras not only by his disciples but also by scholars who were not members of the Pythagorean school itself. See also J. Burnet, Early Greek Philosophy (London 1930) 106–7.

anvil and hammers in the smithy as related by Nicomachus of Gerasa<sup>6</sup> depicts Pythagoras seeking to confirm by visible proof the testimony of his own ear:

One day he (sc. Pythagoras) was deep in thought and seriously considering whether it could be possible to devise some kind of instrumental aid for the ears which would be firm and unerring, such as the visual sense obtains by means of the compass and the ruler or the surveyor's instrument; or the sense of touch obtains with the balance or measuring device. While thus engaged, he walked by a smithy and, by divine chance, heard the hammers beating out iron on the anvil and mixedly giving off sounds which were most harmonious with one another, except for one combination. He recognized in these sounds the consonance of the octave, the fifth and the fourth. But he perceived that the interval between the fourth and the fifth was dissonant in itself but was otherwise complementary to the greater of these two consonances.

Nicomachus goes on to describe how Pythagoras weighed the hammers and transferred the results of his tests to strings under tension comparable to the hammer weights. Boethius (De inst. mus. 1.10–11) also reports the circumstances which enabled Pythagoras to formulate the numerical proportions of the musical consonances. His account, like that of Nicomachus, emphasizes Pythagoras' reluctance to trust the testimony of the auditory sense (qui nullis humanis auribus credens), which he believed to be unreliable by nature and susceptible to external factors (quae partim natura, partim etiam extrinsecus accidentibus permutentur), or that of musical instruments, which admit of variation under the influence of temperature change or other contingencies. According to

<sup>6</sup> Nicomachus of Gerasa is apparently the earliest writer (fl. 120 A.D.) to have transmitted the story, in his *Harmonikon Enchiridion* 6 (Jan 245–46). Other writers, whose accounts of Pythagoras' experiment do not differ essentially from that of Nicomachus, are all considerably later than Nicomachus and may have used him as their primary source. This is unquestionably true of Iamblichus (c250–c325 A.D.) who, in his *De vita Pythagorica* 115–120 (D 66–69), follows Nicomachus almost word for word.

<sup>7</sup> Harmonikon Enchiridion 6 (Jan 246-47). Had this experiment been performed with strings of equal length and thickness, as Nicomachus' account has it, it would have been found that the vibrational frequency of the string producing the higher note had risen proportionally with the square root of the tension. Thus, in order to raise the pitch of a string an octave, it would be necessary to quadruple its tension. Burnet (above, note 5) 107 finds the absurdity of Nicomachus' account to be its chief merit in that it bears the stamp of a true popular tale indicative of "the existence of a real tradition that Pythagoras was the author of this momentous discovery." In terms of actual fact, the data given by Nicomachus can only be interpreted on the basis of string lengths.

Boethius, Pythagoras' discovery was preceded by arduous mental effort (diuque aestuans inquirebat) and was finally achieved through a divine impulse (divino quodam motu). The result of Pythagoras' efforts to translate the phenomena of sound into numbers was the momentous discovery that the numerical ratios productive of the consonant intervals—octave, fifth and fourth—were 2:1, 3:2 and 4:3, respectively. The consonances were thus defined and their numerical definitions were in turn given an objective reality of their own. The underlying principle of harmonia, that is, the proper fitting together of pitch elements into the system of the octave,8 is a numerical system bound together by interlocking ratios externally limited by the octave and internally by the means.9 The system of ratios—6:8:9:12—whose internal means (arithmetic and harmonic) between the extremes expresses the consonant intervals of the musical scale, was called most perfect by Nicomachus (Intro. arith. 2.29.1; Hoche 144) and considered by him worthy of the term harmonia. This series—6:8:9:12—yields, of course, the exact proportional value of string lengths representing the consonant intervals of the octave; i.e. 6:12=1:2 (octave), 8:12= 2:3 (fifth), 6:9=2:3 (fifth), 6:8=3:4 (fourth), 9:12=3:4 (fourth).

The tests by which these mathematical facts were demonstrated were extended by Pythagoras to various other instruments. Of all those mentioned by Nicomachus (striking on dishes, auloi, panpipes, triangular harps), the one most favored by Pythagoras for acoustical experiment was the monochord. This may be inferred from the story reported by Aristides Quintilianus in which Pythagoras, as he lay dying, recommended the monochord to his disciples (*De mus.* 3.2; Winnington-Ingram 97):

Wherefore they say that Pythagoras, as he was departing from this life, advised his companions to study the monochord, explaining that the perfection which exists in music must be comprehended intellectually through numbers rather than sensorily through hearing.

The principle of expressing the divisions of the monochord through number, bequeathed by Pythagoras to his disciples, was the impulse

<sup>&</sup>lt;sup>8</sup> Cf. E. A. Lippman, Musical Thought in Ancient Greece (New York 1964) 1-3.

<sup>&</sup>lt;sup>9</sup> The means are discussed by F. M. Cornford, "Mysticism and Science in the Pythagorean Tradition," CQ 16 (1922) 144-45. A full scale explanation is provided by P. H. Michel, De Pythagore à Euclide (Paris 1950) 387-99.

<sup>10</sup> Nicomachus, Harmonikon Enchiridion 6 (Jan 248).

from which the tradition of harmonic science was to evolve.<sup>11</sup> Yet the division of the monochord, the focus of Pythagorean inquiry, was enlisted not for the purpose of revealing the nature of musical art. Rather, it became the means to an altogether different end—the elucidation of a structural element of the universe. The perfection that Pythagoras saw in music was, in fact, viewed as the microcosm of a cosmic design. Of the Pythagoreans Aristotle thus observes (*Met.* 985B3I-986A2):

And since they saw further that the properties and ratios of the musical scales are based upon numbers, and that numbers are the first elements of all nature, they assumed the elements of numbers to be the elements of everything and the whole heaven to be a harmony and number.

In short, the aim of the Pythagoreans was to arrive at a musical scale that was theoretically perfect, not as applied to music per se, but as it expressed through ratios construed to be analogues to the parts of the universe and its design their conception of the structural elements of the cosmos.

It is difficult for us today to appreciate the effects produced by Pythagoras' discovery on the intellectual spirit of antiquity, particularly on that of the Pythagoreans. It provided the key to the science of acoustics, the consequences of which were extended by the Pythagoreans to the whole domain of physics, and it became the corner-stone of their philosophy of arithmology. As Burnet has observed, 12 "It is not too much to say that Greek philosophy was henceforward to be dominated by the notion of the perfectly tuned string." Pythagoras having fixed the consonant intervals of the octave in terms of the formula, 6:8:9:12, it remained for his successors to ascertain mathematically the loci of the notes intervening between these fixed pitches. The result was a full scale in the diatonic genus. Philolaus, the contemporary of Socrates, is credited with the division of the tetrachord 13 (that segment of the scale bounded by the consonance, the

<sup>&</sup>lt;sup>11</sup> Cf. Henderson (above, note 3) 341.

<sup>12</sup> Burnet (above, note 5) 112.

<sup>13</sup> Nicomachus, Harmonikon Enchiridion 9 (Jan 252-54). See also, H. Diels and W. Kranz, Die Fragmente der Vorsokratiker 1 (Dublin/Zürich 1966) 408-10, fr. 6. The authenticity of the more than twenty fragments attributed to Philolaus has been called into question by numerous scholars, the most cogent arguments against them having been advanced by I. Bywater, "On the Fragments Attributed to Philolaus the Pythagorean," JPh 1 (1868) 21-53 and E. Frank, Plato und die sogenannten Pythagoreer

fourth) into two whole tones and a semi-tone represented in numerical ratios as 9:8, 9:8 and a *leimma*, 256:243, or the interval "left over" after the subtraction of the two whole tones from the fourth (4:3).<sup>14</sup> The octave was then determined by Philolaus to consist of five whole tones and two semi-tones.

In contrast to the mathematical calculations by which Philolaus arrived at these divisions, we have the computations of Archytas who, a generation after Philolaus, calculated the diatonic division of the tetrachord to be two unequal whole tones (9:8 and 8:7) and a semi-tone (28:27). Archytas is credited with the other generic divisions of the tetrachord: chromatic (32:27, 243:224, 28:27) and enharmonic (5:4, 36:35, 28:27). His calculations as well as those of Eratosthenes (third century B.C.) and Didymus (first century B.C.) are preserved by the second century A.D. scientist, Ptolemy. To these computations must be added those of Ptolemy himself. In addition to these important evaluations of intervallic divisions of the generic scales, we possess the tract of Euclid, the Sectio Canonis, in which Pythagorean harmonics is given its most complete statement. The tonal system wherein pitch is represented by number is treated as congruent with mathematical principles only, the question of music as an art having been completely superseded by the dictates of mathematical science. 17 The original Pythagorean postulate, thus generalized and refined, presided over the research into harmonic science for centuries. Finally, we have the most elegant statement of the Pythagorean notion of the

<sup>(</sup>Tübingen 1962) 263-335. Although the divison of the tetrachord attributed to Philolaus is suspect for the reasons outlined by Frank (pp. 270-71), there is no reason to suppose that Philolaus did not in fact attempt it in accordance with the Pythagorean principles to which he seems otherwise to have adhered (cf. G. S. Kirk and J. E. Raven, The Presocratic Philosophers [Cambridge 1969] 312-13). The difficulty here seems to stem from Nicomachus' possible misrepresentation of the facts. This view demands, of course, a closer examination of the problem than can be attempted here.

<sup>14</sup> The procedure is described by Nicomachus, Excerpta 2 (Jan 267-71) and Boethius, De inst. mus. 3.5.

<sup>15</sup> Ptolemy, Harm. 1.13 (Düring 30-31). The ratios represent descending tetrachords.

<sup>&</sup>lt;sup>16</sup> Ptolemy, Harm. 2.14 (Düring 70–74). These computations as compared by Ptolemy with Aristoxenian musical intervals are studied by R. P. Winnington-Ingram, "Aristoxenus and the Intervals of Greek Music," CQ 26 (1932) 195–208, who demonstrates certain affinities between Aristoxenus' generic divisions and those of Archytas.

<sup>17</sup> Cf. Lippman (above, note 8) 156.

harmonic structure of the universe in the cosmic scale enunciated by Plato in the *Timaeus*.

The profundity of the Pythagorean construct—6:8:9:12—can scarcely be over-emphasized, for herein was embodied the alleged structural principle of the universe. 18 The discovery, however, that within the very core of this perfectly attuned universe there existed a flaw was as momentous a revelation for mathematical science as the original discovery of string length proportions itself had been earlier. The Pythagorean harmonia based on the notion of an intrinsic symmetry in the natural universe and concretized in the formula of interlocking ratios, was, in fact, violated by the inescapable force of the irrationality of musical space. The fact that the ratio 9:8 was unsusceptible of equal division meant that the octave itself could not be divided equally, that there was in fact no mathematical basis for the representation of the semi-tone in rational numbers.<sup>19</sup> That is, the whole tone represented by the ratio 9:8, itself the difference between a fifth and a fourth  $(3:2 \div 4:3)$ , cannot be divided equally without the use of a surd, or  $3:2^{\sqrt{2}}$ .

The impact of the discovery of incommensurables on mathematical theory was critical; it opened the way for the advances made by such scholars as Theodorus of Cyrene around 400 B.C. and, under his stimulus, Theaetetus, whose theory of irrationality marks him as one of the most original mathematicians of all time.<sup>20</sup> At the same time, the investigations of irrationality in music generated a new branch of applied mathematics—harmonic science. Accepting number as the foundation for the pitch distinctions of musical sounds, and hence for the

<sup>18</sup> This is exemplified in the theory of the "harmony of the spheres." The nature of the tradition and its associated difficulties are examined by J. A. Philip, Pythagoras and Early Pythagoreanism (Toronto 1966) 110–133. It was the revelation of the all-pervading character of number in music that quite possibly prompted the Pythagoreans to postulate that all things could be reduced to number. On this same basis they would be led naturally to the idea of the harmony of the spheres, in which the laws of the unknown macrocosm, the heavens, are explained by analogy with those of the known microcosm, music. Cf. Sir Thomas Heath, Aristarchus of Samos (Oxford 1913) 46–47, who believes that Pythagoras' discovery led directly to the doctrine of the harmony of the spheres.

<sup>&</sup>lt;sup>19</sup> The discovery of the irrational element,  $\sqrt{2}$ , is usually associated with the geometric theorem concerning right-angled triangles, in which it was revealed that the length of the diagonal of such triangles was not uniformly expressible as an integer. In particular, the diagonal of the square was shown to be  $\sqrt{2}$  or alogos. Cf. Philip (above, note 18) 200.

<sup>&</sup>lt;sup>20</sup> F. Lasserre, The Birth of Mathematics in the Age of Plato (Larchmont 1964) 65-70.

measure of their authenticity and value, the harmonic scientists treated number as the absolute objective reality of music. The systematic confrontation of the musical facts represented by number was for them the sole source of knowledge about music. These investigations, however, committed to mathematical explanations and at the same time faced with the insurmountable difficulties posed by incommensurables, ultimately led, as they must, to musically impractical, i.e. counter-intuitive, results.

For those who taught the practical art of music, those Harmonists against whom Aristoxenus inveighed in his Harmonics, the irrationality of musical space was an insupportable difficulty. Properly speaking, the harmonic theorists were concerned with the correct "fitting together" of musical scales. Such scales, constituted of pitch sequences distributed in a proper relationship to one another, could scarcely represent a true harmonia if based on an inherent irrationality that required readjustment of all intervals smaller than a whole tone. The problem was faced independently as early as the sixth century B.C. by Lasus of Hermione, the dithyrambic poet, musical theorist and teacher of Pindar, whose solution consisted in assigning the attribute of breadth to musical notes, a notion rejected by Aristoxenus (Harm. 3) as useless in determining exactly what a musical note is.21 Furthermore, we know from Aristoxenus, who cites his predecessors in order to criticise them (Harm. 5-7), that the procedure these latter theorists adopted to rid the musical scale of inherent irrationality 22 involved an empirical process of reducing intervals to the smallest possible indivisible quantity, that is, to an atomic interval. This interval would only be appreciated by the ear; it would not necessitate number for its determination since Pythagorean theory would not permit its numerical representation, on the

<sup>21</sup> Lasus' treatise, *De musica*, of which only a few fragments survive, is believed to be the most ancient treatment of the subject. He is reported by Theon of Smyrna *Exp*. 12 (Dupuis 96) to have experimented with the vibratory motions of sound-producing bodies in connection with the calculations of the consonances. For a discussion of his contributions to musical theory, see F. Lasserre, *Plutarque de la musique* (Olten and Lausanne 1954) 34–44. On the question of "breadth" cf. Henderson (above, note 3) 342 and Macran (above, note 1) 226–27.

<sup>22</sup> Aristoxenus does not state explicitly that this was the purpose of the harmonists' empirical procedures. Their aim was in reality more practical than theoretical: to discover an homogeneity in the musical continuum that would render intermodulations possible. Cf. Macran (above, note 1) 230–32 and Henderson (above, note 3) 342 for discussion of this question. See also, F. Lasserre (above, note 20) 175–76.

grounds that so small a fraction on the sound continuum could only be produced by a difference of tension and not by an appreciable difference of string length. Assuming that a musical scale is homogeneous in all its parts and that an interval is a continuous quantity that admitted of increase and decrease by minimal degrees, they endeavored to construct a close-packed system of scales, a katapyknôsis, or an arrangement of pitches at the closest possible intervals, and so establish a continuous series of equi-distant sounds separated by the smallest possible intervals (Harm. 7). This search for homogeneity in the musical scale is one that persists to this day, the tempered scale currently in use being only one not completely satisfactory solution to the problem of irrationality. Aristoxenus' objection to the empirical procedures of the practical harmonic theorists was fundamentally the same as the one he leveled against the mathematically-minded theorists, namely that the results of empirical techniques had as little relevance for the concerns of musicality as had the mathematical formulations of pitch and interval.<sup>23</sup> First, the nature of the empirical experiments seriously limited the focus of research, to the extent that the enharmonic, that genus admitting of the quarter-tone interval or diesis became, within the range of an octave, the sole object of study (Harm. 2); secondly, the unbroken series of small intervals postulated by these harmonists was inconsistent with the nature of musicality in that a succession of more than two micro-tones was musically impossible (Harm. 28),24 having existence in mathematical

the division of the whole tone into twelve equal parts with the resultant value of the semi-tone being 6/12, that of the quarter-tone 3/12, etc.—also has no basis in mathematics or empirical results. But the numerical division of the whole tone did not count for Aristoxenus as any solution to the problem posed by incommensurability. As we have seen, the solution for him lay, rather, in shifting the entire theoretical focus away from mathematics and empiricism to the domain of musical competence. His tetrachordal divisions simply enabled him to represent conveniently the various positions that movable notes such as lichanoi can occupy within the genera and the chroai. Cf. Macran (above, note 1) 248–49 and Winnington-Ingram (above, note 16) 197: "To sum up, we may say that Aristoxenus' primary object is to delimit the spheres of enharmonic, chromatic and diatonic by defining the loci of the movable notes in each . . . He himself reveals that they do not represent all the genuinely melodious divisions, and in particular that equal division of the pycnon is not obligatory."

<sup>&</sup>lt;sup>24</sup> Diagrams of "condensed" scales comprising a series of twenty-eight quarter-tones were produced by the harmonists, the series constituting an octave and a tone. Their attempts to represent these sequences in notation provoked Aristoxenus' acerbic criticism. Cf. L. Laloy, *Aristoxène de Tarente* (Paris 1904) 114–17.

theory only. Aristotle's concurrence on this point is well taken (Met. 1053A14-16): "The unit of measurement is not always 'one' numerically but sometimes is more than one, as is the case with two dieseis, which are measured not by ear but by computations." In essence then, katapyknôsis was unmelodious and of no practical value in any way (Harm. 38). Thus, on the one hand, the work of the mathematical theorists eventually resulted in concerns "utterly extraneous to the subject and quite at variance with the phenomena" (Harm. 32); the procedures of the empirically-minded harmonists, on the other, degenerated into the absurdities noted by Plato (Rep. 531A-C). It remained for Aristoxenus to redefine the limits of harmonic science in terms of the essential nature of music itself.

Π

To accomplish what he considered the task of a musical theory, Aristoxenus reversed the philosophical conceptions of his day, founding a new school of musical thought whose precepts were to become as influential for the study of music as those of Pythagoras himself. has been summarily outlined in the preceding paragraphs, Greek theorists had been concerned to verify the elements of music through examination of objective data. In this effort they had recourse to empirical methodology or to mathematical physics, neither of which in Aristoxenus' opinion could justly account for music. For Aristoxenus music was primarily a function of the human mind and resided only secondarily or derivatively in actual musical usages. The difference between Aristoxenus' conception and that of the empirical and mathematical theorists is, in fact, one that persists to this day in numerous disciplines quite apart from ancient musicology. To state the matter somewhat oversimply, it is the difference between theories designed to represent primarily certain functions of the mind and thereby to account for the objective data, and those which consist in methods for dealing with the data with the view of arriving by this means at conceptions of mental functions. It is the difference, in other words, between a rationalist and an empiricist theory. The extent to which investigative procedures are rooted in one or the other of these approaches leads to dichotomies observable in disciplines as technically disparate as ancient

musicology and, for example, modern psychology, anthropology and linguistics. In ancient Greek music, certainly, the lines are sharply drawn. The significance of Aristoxenus lies in his recognizing that a question of theoretical priorities existed in the approach to music, and in founding a new science using only those materials that belong to music itself—pitch and its apprehension by the human ear. Disavowing the search for logical bridges from experience to theory, he directed himself straight toward basic principles.

Aristoxenus was especially well equipped for his undertaking, having been thoroughly trained in music and philosophy. Born in Tarentum<sup>25</sup> around 360 B.C., he received his earliest instruction in music from his father, Spintharus, a professional musician, as well as from Lamprus of Erythrae.<sup>26</sup> Grounded in music, he benefited also from the circumstance that Magna Graecia was a Pythagorean center, Tarentum itself being the birthplace of Lysis and Archytas.<sup>27</sup> It may be assumed that Aristoxenus was indoctrinated from an early age in Pythagorean thought whether through his father, who probably knew Archytas,<sup>28</sup> or from his having spent his youth in a Pythagorean milieu. It is certain at least that whatever training he received at Tarentum was amplified by formal study at Athens with the Pythagorean Xenophilus of Chalcis.<sup>29</sup> Equipped thus with professional training in music and Pythagorean philosophy, he came finally to the Academy where, as a Peripatetic and student of Aristotle, he was to formulate his theory of music.

Despite unanimous agreement among scholars that Aristoxenus, by virtue of his comparatively early date and the rather considerable remains of his writings, is the foremost technical writer on the music of

<sup>25</sup> All that is known of Aristoxenus' life comes primarily from the account of the Suda s.v. Άριστόξενος. Additional references have been collected by F. Wehrli, Die Schule des Aristoteles 2 (Basel 1945) fr. 1–9. The facts are examined by Laloy (above, note 24) 1–16 and Macran (above, note 1) 86. Cf. da Rios (above, note 2) 95–136 for a convenient reassemblage of all ancient testimonia pertaining to the life and work of Aristoxenus.

<sup>&</sup>lt;sup>26</sup> Nothing is known of this Lamprus other than that he is not the celebrated musician mentioned by Plato, *Menex.* 236A and Aristoxenus as recorded by Plutarch, *De mus.* 1142B. Cf. Laloy (above, note 24) 11.

<sup>&</sup>lt;sup>27</sup> Diels and Kranz (above, note 13) 421, fr. 46.3 (Lysis) and fr. 47.1 (Archytas).

<sup>&</sup>lt;sup>28</sup> Spintharus' name was associated with numerous celebrities such as, Damon, Philoxenus, Socrates and Epaminondas. Cf. Laloy (above, note 24) 4–5.

<sup>&</sup>lt;sup>29</sup> Diels and Kranz (above, note 13) 442-43, fr. 52.1-3.

ancient Greece, his theory as we have it has often been regarded more as a deterrent than as an aid to our understanding of Greek music. In fact, much of the scholarly controversy that exists to this day in the field of Greek music is largely accounted for by the positions that scholars have taken vis-à-vis Aristoxenus' theory. Thus, his English translator, H. S. Macran,<sup>30</sup> says of him in general approbation, "The conception, then, of a science of music which will accept its materials from the ear, and carry its analysis no further than the ear can follow; and the conception of a system of sound-functions, such and so many as the musical understanding may determine them to be, are the two great contributions of Aristoxenus to the philosophy of Music." On the other hand, the judgment of J. F. Mountford<sup>31</sup> expresses a more recent and generally accepted criticism of Aristoxenus' position:

For him (sc. Aristoxenus) pure mathematics and physics had no attraction. He postulated that in music the ear is the sole and final arbiter and that a mathematical formula had little or nothing to do with music. In this he was absolutely wrong, so far as theory goes; and so far as the art of music is concerned, he was only partially right. . . . To rely only upon the ear for the data of a system of musical theory is to use a rough-and-ready method.

Mountford concludes that Aristoxenus' conception of musical intervals "proves to be a quite impenetrable barrier to a proper knowledge of the nature of Greek scales" and that his theory at best is "too unscientific to be of real service." According to R. P. Winnington-Ingram: 32

His (sc. Aristoxenus') importance, however, is very great, not only from his comparatively early date but because he claims to champion the direct musical consciousness against the scientific approach of some of his predecessors and contemporaries. But if they are under suspicion of letting irrelevant factors intrude into their calculations, he must be equally suspected of yielding to the attractions of symmetry and convenience.

Most recently W. D. Anderson,<sup>33</sup> expressing the received opinion respecting Aristoxenus' significance, dismissed Aristoxenus as a possible source of information on the modes or *harmoniai* of an earlier

<sup>30</sup> Macran (above, note 1) 89.

<sup>31</sup> In the Introduction (xxi) to K. Schlesinger, The Greek Aulos (London 1939).

<sup>32</sup> Winnington-Ingram (above, note 16) 195.

<sup>&</sup>lt;sup>33</sup> W. D. Anderson, Ethos and Education in Greek Music (Harvard: Cambridge 1966) 18 and 27.

period, judging his theory to have "a certain complex majesty, but [taking] us into a realm of theoretical perfection which the Harmoniai of the earlier Hellenic period can hardly have known." According to Anderson, systems such as that of Aristoxenus would appear to amount to little more than "dead abstractions of theory divorced from musical practice."

The major objections to Aristoxenus' theory involve, it would seem, a fundamental reluctance to accept a system based on the postulated activity of a musically intuitive intelligence, itself unobservable, as Aristoxenus himself was at pains to admit (*Harm.* 41), and therefore, according to some scholars, yielding unmeasurable, hence unscientific, results. This attitude has tended, unfortunately, to obscure Aristoxenus' revolutionary insight into the nature of music.

H. S. Macran's eloquent appreciation of Aristoxenus' unique position in ancient theory has only recently been complemented by the penetrating appraisal of E. A. Lippman, who goes far to set Aristoxenus' concepts in their proper light: 34

Aristoxenus turns to melody—a human rather than a natural manifestation and typified in the voice—and his laws are still more closely bound up in the detailed and inherent nature of his data. He has learned from Aristotle how to define the province of a science, not only how to find its natural divisions but especially how to determine the nature of its principles. . . . the result of Aristoxenus' application of the Aristotelian outlook is an aesthetic capable of accounting for the detailed structural properties of musical perception.

Aristoxenus' rationally based principles as they were applied by him to music theory have been further set forth in exemplary form by Henderson.<sup>35</sup> Her statement of Aristoxenus' theoretical aims and methods does full justice to the earliest attempt by an ancient thinker to provide a systematic understanding of what centuries of pre-Aristoxenian musical tradition had left shrouded in darkness. Henderson states the case concisely:<sup>36</sup>

As Aristoxenus recognized, real melody presupposed not a fixed scale or tuning, but a line on which the voice's potentially infinite stations could be determined only by ear and understanding (ἀκοὴ καὶ διάνοια). Given

<sup>34</sup> Lippman (above, note 8) 146.

<sup>35</sup> Henderson (above, note 3) 344-51.

<sup>&</sup>lt;sup>36</sup> Henderson (above, note 3) 343.

a good ear to hear intervals, the mind must define them by melodic functions. The only sane divisions of musical space was by 'consonances' (i.e. the melodic progressions to the fourth, fifth and octave): these the ear could judge exactly, or within a hair's breadth, whereas it found other intervals 'dissonant' and variable in size.

As we have seen above, the assumption by Aristoxenus of the ear as arbiter and substitute for numerical method led Mountford and others to raise the objection that Aristoxenus' theory, grounded in the principle of aural intelligence, could only result in a rough-and-ready formulation, unscientific, overly-symmetrical and difficult to understand. This critical position fails to apprehend not only Aristoxenus' primary aim but the nature of music itself. On the other hand, implicit in Henderson's explanation of Aristoxenus' analysis of the facts of music is the recognition and assimilation of the radical core of Aristoxenus' philosophy. Under the stimulus of her exegesis of Aristoxenus' delineation of one of man's most mysterious abilities is truly scientific.

## III

Antiquity conferred on Aristoxenus the title "musician." The title suggests that Aristoxenus was not merely a philosophically trained theoretician, but that he was, additionally, a musical practitioner, with assumptions about the art of music similar to those of a practicing musician. Against such a background he recognized that the art of music is a complex of many interrelated parts, of which Harmonics, albeit of primary importance, is nonetheless only a part of the larger discipline. As he says (Harm. 22), "To be a musician, as we are always

<sup>37</sup> Cf. Wehrli (above, note 25) 68.

<sup>38</sup> Mousikos in its widest sense signifies a man of letters, a scholar, a cultivated person, for which see LSJ s.v. II.2 and J. A. Philip, "Mimesis in the Sophistes of Plato," TAPA 92 (1961) 455. Its construction with mousike—vocal and instrumental music—suggests the specific meaning of musician in the technical sense of the word. Thus, for example: Αριστόξενος ὁ μουσικὸς θηλυνομένην ἤδη τὴν μουσικὴν ἐπειρᾶτο ἀναρρωνύναι, for which see Wehrli (above, note 25) 28, fr. 70. Cf. also Cicero, De orat. 3.33.132 who, in noting the professional specializations within the arts and sciences, sets the musicians (Aristoxenus and Damon) quite apart from the men of letters (Aristophanes and Callimachus).

insisting, implies much more than a knowledge of Harmonic, which is only one part of the musician's equipment, on the same level as the sciences of Rhythm, of Meter, of Instruments." If, then, Aristoxenus presents us here with the Harmonic only, it is not because he believed that to comprehend all of musical art; 39 it is just that he wished to devote an entire work to the principles underlying the production of melody. At the same time, he did not want his theory to be mistaken for something it is not. In this connection he relates the story of the students who came to Plato's lectures on the Good (Harm. 30) expecting to learn all about the material goods-riches, health, or strength-and were disappointed to hear only about arithmetic, geometry, and astronomy. In the same way he advises his students not to expect the Harmonics to reveal every aspect of the musical art. A good deal of the criticism leveled at Aristoxenus is based on the mistaken idea that the Harmonics is actually a general theory of music, when, in fact, as Aristoxenus had been at pains to make clear, it is only a systematization of the rules governing melodic production.

At stake, thus, was the determination of the most economical, explicit and formal principles that would account for music's expressive potential, while at the same time the standards of a logically conceived system would be met in which nothing was ad hoc or redundant. In approaching this task, Aristoxenus realized that the kinds of structures that must be postulated to underlie the musical expression were not demonstrable in mechanistic terms. That is, in order to do justice to man's ability to create music, it was not thought necessary by Aristoxenus to postulate numerical ratios inside man's brain, but rather a thinking substance, a musical intuition, to account for the musician's mastery of a complex and rule-governed skill. If the musician's utterances are made in accordance with the elements characterized as musical by Aristoxenus and with the rules ascertained by him to underlie these utterances, we may assume with Aristoxenus that such

<sup>&</sup>lt;sup>39</sup> Aristoxenus wrote on various other aspects of music in addition to Harmonics. Nothing survives of these works save an incomplete treatise on Rhythm, for which see R. Westphal, Die Fragmente und die Lehrsätze der Griechischen Rhythmiker (Leipzig 1861). In addition to separate works on musical instruments, melodic composition, the dance in tragedy and other topics, he wrote what may have been a general theory of music, a Peri Mousikês. For references to these and other works by Aristoxenus, see Wehrli (above, note 25) fr. 69-94.

utterances are manifestations of the musician's mastery of the art. It is reasonable to suppose, moreover, that ancient Greek music, like the music of any other culture, had a general character deriving from the fact that its elements were governed by certain rules. The justification for Aristoxenus' particular composition of the rules of the Greek musical idiom is simply that he was a native practitioner of the art and, as such, knew intuitively what the elements of Greek music were. Though he does not record for us particular instances of Greek music, this not being his intention, he does provide a set of rules capable of generating the utterances he knew intuitively to be music. system of rules, constituted as a "grammar" in the sense that it was capable of generating all and only those melodic sequences that are musically acceptable, depended on the musical intuition of the user as well as on the existence of certain universal properties of music consonance and dissonance. Aristoxenus' system of rules is formal in the sense that, while it refers to actual elements of music (pitch and interval), it can be translated into formal terms. It is explicit in the sense that it states the relationship between the musical forms that by a series of logical steps are produced in proper sequence and combination, the interpretation of which depends on the mind of the user.

Implicit in Aristoxenus' statement of his theory is his recognition of the infinite possibilities on the sound continuum both in extension and in diminution (Harm. 15). As a consequence, melody in the abstract would admit of an infinite number of sequences. That is, the domain of music is infinite and boundless. If a theory attempted to describe specifically each and every permitted sequence it, too, would be infinite in length. The determination of the way in which musicians manage to produce from a finite system an infinite number and variety of combinations is the essence of Aristoxenus' theory. He saw certain basic processes in the structure of Greek music, a purely melodic music as opposed to harmonic in the modern sense, that could be reapplied recursively. At the same time these processes were themselves restricted by the practical limitations of the practitioners of the art. Thus Aristoxenus says (Harm. 14), "What the voice cannot produce and the ear cannot discriminate must be excluded from the available and practically possible range of musical sound." The imposition of limits epi to mikron and epi to mega on the infinite possibilities of sound,

these limits dependent on musical intuition, constitute the Aristoxenian definition of music.

Aristoxenus' musician's understanding of what a musical work must comprise in order to attain the rank of true art is unexampled in the theoretical documents of antiquity. Laloy thus says of him,<sup>40</sup> "je ne crois pas que l'antiquité nous ait laissé sur la musique de pages plus justes et mieux senties que celles où il pose les conditions du jugement musical." To explain his superior understanding, Laloy suggests that Aristoxenus' doctrine adumbrates a rudimentary Kantian aesthetic, "une sorte de kantisme inconscient." He does not press the point, however, in part on the grounds that Aristoxenus does not have a special word to denote intuition. Kantian aesthetics aside, the fact is that Aristoxenus did have such a word—synesis.

The notion of synesis in the sense of an innate mental faculty admits of no easy description. For Aristoxenus, as for others, it is a proposition of some complexity. There is no concrete means for representing its activity as, for example, by notational symbols. On these grounds Aristoxenus criticizes those "who aver that notation of melodies is the ultimate limit of the apprehension (τοῦ ξυνιέναι) of any given melody" (Harm. 39). The living tones of music as apprehended by the mind could no more be represented for him by symbols than could the letters of the alphabet represent the living tones of language for Herder.<sup>42</sup> What is responsible for the creation of music is not notation, or harmonic science or musical instruments (Harm. 42) any more than are the activities of the hand or mouth other than those of mere appurtenances. It is, rather, the apperception of a reflective being, or, as Aristoxenus says (Harm. 41), it is the "synesis buried deep in the soul" that is the creative force. This faculty, synesis, is made up of the ear and the intellect (Harm. 38), the ear providing the perception, the intellect with its ability to remember (Harm. 39) the discrimination. The powers of aural perception and mental apperception are combined in musical synesis—that unique human faculty that hears, remembers and distinguishes. Aristoxenus' a priori notion of musical synesis as the intellectual process responsible for the creation of music cannot be

<sup>40</sup> Laloy (above, note 24) 262.

<sup>41</sup> Laloy (above, note 24) 164.

<sup>&</sup>lt;sup>42</sup> Johann Gottfried Herder, "Abhandlung über den Ursprung der Sprache," Sämtliche Werke 5, ed. Bernhard Suphan (Hildesheim 1967) 8.

justified in terms of Lippman's analysis, however. As Lippman sees it,43 "The peculiarity of the method [advocated by Aristoxenus] is that hearing and reason do not really act together; they are assigned to distinct tasks. Thus reason is responsible for the logical structure of the whole science and of its particular arguments, as well as for determining the functional relationship between tones; but it does not participate in the judgment of the size of intervals; this depends solely on auditory discrimination." He adds further,44 "consonance is a fact given in audition, and when dissonance is measured by means of consonance, the process of measurement transpires wholly within the sphere of hearing —reason and mathematics have nothing to do with it." But sensation and rational thought do not exhaust the sources of knowledge. Mediating between the two is some other faculty of understanding—intuition, competence, apperception—and it is this faculty that lies at the heart of Aristoxenus' theory. Lippman's remarks, above, thus do not touch Aristoxenus' deeper understanding of the true principle of music. They would explain only how intonation is rendered more exact. They do not account for the composer's ability to image music in his mind nor for the listener's ability to react to its affective power.

To be sure, the interaction of sensation and intuitive knowledge raises a vast complex of philosophical questions. For the musician, however, it is essentially an underived principle conceived by him to underlie all his creative activity. A musician "creates music by 'hearing it out'... in his creative imagination through his 'mind's ear'." The capacity to conceptualize musical tones "is a condition for learning, for retention, for recall, for recognition, and for the anticipation of musical facts." This is the musician's fundamental principle which Aristoxenus adopts as a primary truth (*Harm.* 44). In this capacity lies the ability to "know" consonance, to measure dissonance, to determine the consequent collocations of tones into basic systems capable of generating melody.

A generating system of music may be explained by considering music as an act inseparable from the scale system—or set of rules for collocating pitches—that is useful for performing the musical act or

<sup>43</sup> Lippman (above, note 8) 149.

<sup>44</sup> Lippman (above, note 8) 151.

<sup>&</sup>lt;sup>45</sup> Carl E. Seashore, Psychology of Music (New York 1967) 5-6.

range of acts. That is, the scale and the musical act are considered as a unity seen from two different points of view. The musical scale in which relationships between one pitch and another are established as functional in particular ways is, in this sense, akin to the rules of a game such as chess. The rules of chess, for example, constitute and regulate the game; but the existence of the game is also logically dependent on the rules. The rules create, as it were, the very possibility of playing the game.<sup>46</sup> With this in mind, it is useful to consider a case in which the music of a composer and the rules are both familiar to us as, for example, the case of Claude Debussy. Debussy's music is markedly distinctive to everyone; its ethos, we might say, is consistently recognizable. The language used to describe this ethos is characteristically evocative: "shimmering," "bloodless," "gossamer," "crepuscular," "iridescent," etc. In terms of theory, the system that generates Debussy's distinctive melodic line (and harmonic, i.e. chordal structure) is the scale composed of whole tones only.<sup>47</sup> This scale of whole tones is an abstraction having no reference to absolute pitch; it exists in theory in a distinct interval sequence, but it can be conceptualized or imaged by the musically intuitive mind. The music it constitutes, the music logically dependent on its rules of collocation, is recognized by other minds as distinctive in ethos. In this sense the concept of the whole tone scale is inseparable from the musical art of Debussy. Deeper analysis would reveal that the apparently infinite harmonic and melodic combinations of Debussy's music are dependent on a set of iron-clad and limiting rules that determine the dynamic relationships between each pitch of the scale. Following Aristoxenus' prescription, the learning of these rules would not alone guarantee the ability to compose the music of Debussy; for that one would need Debussy's individual genius. Knowledge of the rules would, however, enable one to compose in the style of Debussy. In order, then, to account for the

<sup>&</sup>lt;sup>46</sup> Cf. J. R. Searle, *Speech Acts* (Cambridge 1970) 33-42, where various categories of rules are examined.

<sup>&</sup>lt;sup>47</sup> This is sometimes called the Six-Tone scale, the seventh tone merely completing the octave above the fundamental. Under this system, progressions of chords are generated—e.g. unresolved dominant sevenths and ninths—which tend to obscure central tonalities. Using these chords as the impressionistic painters used bits of color to evoke images, Debussy commingled them in various combinations of species, or else concentrated them in sequences without any reference to key, producing thereby a music as mobile as water.

expressive potential of Debussy, one has two choices: either to record every note and combination of notes written by Debussy or to extrapolate a cognitive system which would provide in explicit and formal terms the substructure of Debussy's musical activity. The latter option was the sort adopted by Aristoxenus.

The Aristoxenian system has been presented with admirable clarity and concision by Henderson 48 who explains that "its essential character lies in the logical priority of the fixed notes which hold the melody between the iron girders of consonant progressions . ." 49 The entire system is constructed on the basic unit of the tetrachord bounded by the fixed notes of the smallest consonant interval, the fourth, whose fixed pitches are determined by the ear. The combined couplings of tetrachord upon tetrachord by disjunction and conjunction result in a two-octave extension, as, for example, B—a', the missing low pitch (A) being supplied by an added note or *phthongos proslambanomenos*. Each tetrachord is filled in with two movable notes whose collocations in the diatonic genus are established by tuning from an initial pitch in ascending fourths and descending fifths. Thus, tuning by consonances from a pitch E, for example, will fix the proper pitches of two conjunct tetrachords in the diatonic genus:50

This yields the pitches of the sequence:

As Aristoxenus explains (*Harm.* 55), the determination of intervals in the other direction requires the reversed tuning by consonances to ascending fifths and descending fourths. Tuning by consonances again from the pitch, E, will fix the proper pitches of two disjunct tetrachords in the diatonic genus:

This yields the pitches of the sequence:

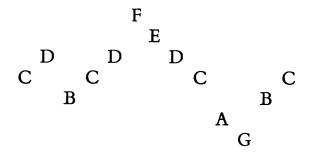
<sup>48</sup> See above, note 35.

<sup>49</sup> Henderson (above, note 3) 345.

<sup>&</sup>lt;sup>50</sup> Aristoxenus, *Harm.* 55, explains this means of determining the loci of all pitches through consonant relations. Cf. Macran (above, note 1) 285–86.

The alteration of two pitches, F# to F# and C# to C# will produce the chromatic genus. The further flatting of these pitches by a quartertone (diesis), F\$\beta\$ to E<sup>+</sup> and C\$\beta\$ to B<sup>+</sup>, will produce the enharmonic genus. Additional alterations yield other nuances (chroai) within the tetrachord limits. Each note of the two-octave system was designated by a name, an adjectival derivative modifying an implied noun, chorde, together with the tetrachord to which it belonged, the resulting terminology being somewhat formidable but serviceable for theoretical purposes. From this two-octave system, octave segments or species (eidê) were derived, each of which was designated by a modal name, Mixolydian, Lydian, Phrygian, Dorian, etc. This, in skeletal form, is the system developed by Aristoxenus from the initial determination of fixed pitches by consonances. It is not a description of music but a delineation of the basic elements conceptualized by the mind of the composer in terms of which his musical utterance is formulated. That is, it constitutes the rules underlying melodic progression, these rules being intuited by the musically competent mind.

To illustrate how a comparable set of rules would operate, one might consider a melodic progression which is generated by the rules of sixteenth century Canto Fermo writing. The melodic line



is musical but

is not. The underlying structure C D E F G A B C does not itself provide the reasons why the one melody is musical and the other

unmusical, but the rules of scale-step attraction do.<sup>51</sup> These rules, internalized and apperceived by the writer musically conscious of Canto Fermo, are the generating factors responsible for the musical melodic line. Thus, the internal relationships between the elements of C D E F G A B C cannot be thought of as separate from the melodic Canto Fermo.

To judge that Aristoxenus' symmetrical system is unrepresentative of Greek musical practice and exists solely in abstract theory is to misinterpret its goal. Rather, if one considers it to be a representation of the way in which the ancient musical mind ordered the elements of music, and not a description of the musical anatomy alone, the implication would be that the Aristoxenian system reflects a remarkably complex and highly developed art form that was in no sense primitive. That so little is known for certain about this musical art stems in part from an almost total lack of actual musical examples, as well as from the numerous difficulties connected with the interpretation of the theoretical evidence. Nonetheless, it appears from the considerations of this paper that progress in understanding the nature of Greek music can best be made by approaching the problem from the point of view that Aristoxenus represents an intelligence du milieu and as such, expresses a musical competence which is reflective of that milieu. Because of this fact, studies which do not discriminate between the nature of the testimony offered by Aristoxenus and that of others proceeding at second hand or from opposite epistemological orientations will tend to level out differences that are highly significant for an understanding of Greek music.

51 The functional resolutions of the active scale steps—leading-tone to tonic, sub-mediant to dominant, sub-dominant to mediant—are explained by P. Goetschius, Elementary Counterpoint (New York 1910) 5–7. As Goetschius observed (p. 5), "Probably the most vital law of melody is that which is grounded in the relations and interactions of the primary harmonies of the key, and which determines the direction of certain Scale-steps."



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## THE DIASTALTIC ETHOS

## JON SOLOMON

RISTIDES Quintilianus, Manuel Bryennius, and Cleonides all discuss ethos in their musicological treatises,¹ and each of the three, along with Ptolemy,² mentions the "diastaltic" ethos.³ Aristides (30. 13) describes it as the musical ethos "through which we arouse the spirit" (τὴν δὲ διασταλτικήν, δι' ἦs τὸν θυμὸν ἐξεγείρομεν). Cleonides (206. 4–8) describes it as the musical ethos "through which magnificence, the manly elevation of the soul, heroic deeds, and similar feelings are displayed; it is used in tragedy and genres of this character" (ἔστι δὲ διασταλτικὸν μὲν ἦθος μελοποιίας, δι' οὖ σημαίνεται μεγαλοπρέπεια καὶ δίαρμα ψυχῆς ἀνδρῶδες καὶ πράξεις ἡρωϊκαὶ καὶ πάθη τοὐτοις οἰκεῖα). Bryennius (362. 19–24) merely repeats the definition of Cleonides.⁴ Ptolemy (106. 14–15) mentions the diastaltic ethos only in an astronomical-musicological context. Though the definitions that Greek musicologists (and Plato and Aristotle) give to the various ethe are

1. Modern editions of the Περὶ μουσικῆς by Aristides Quintilianus (ca. A.D. 200?) are those by A. Jahn, Aristides Quintilianus "De musica" libri III (Berlin, 1882), and R. P. Winnington-Ingram, Aristides Quintilianus "De musica" libri tres (Leipzig, 1963). Only one German translation exists, that by R. Schäfke, Aristides Quintilianus: "Von der Musik" (Berlin, 1937). No English translation has been published, though T. J. Mathiesen is preparing one for future publication. For the Είσαγωγή άρμονική of Cleonides (date unknown, also referred to as Euclid, Pappus, and Zosimus), see the still indispensable K. von Jan, Musici scriptores graeci (Leipzig 1895), pp. 167-207, and H. Menge, Euclidis opera omnia, vol. 8: Euclidis "Phaenomena" et scripta musica (Leipzig, 1916), pp. xxxvii-liv, 186-223. An English translation can be found in O. Strunk, "Harmonic Introduction," Source Readings in Music History (New York, 1950), pp. 34-46. I have prepared a new text and translation which soon will be submitted for publication. Presently it rests as a dissertation (Chapel Hill, 1980). For the Byzantine Bryennius (fourteenth century), see I. Wallis, Operum mathematicorum, vol. 3: Μανουήλ Βρυεννίου άρμονικά (Oxford, 1699), pp. 357-508, and G. H. Jonker, The "Harmonics" of Manuel Bryennius (Groningen, 1970); the latter includes an English translation. All references to Cleonides will specify the page and line numbers of Jan's edition, those of Aristides will refer to Winnington-Ingram's edition, and those of Bryennius to Jonker's

For a general discussion of musical ethos, the reader is referred to Pl. Resp. 397-400; S. Michaelides, The Music of Ancient Greece: An Encyclopaedia (London, 1978), pp. 110-13; E. A. Lippmann, "The Sources and Development of the Ethical View of Music in Ancient Greece," Musical Quarterly 49 (1963): 188-209; H. Abert, Die Lehre vom Ethos in der griechischen Musik (Leipzig, 1899); and W. D. Anderson, Ethos and Education in Greek Music (Cambridge, Mass., 1966).

- 2. For an edition of Ptolemy's 'Αρμονικά, see I. Düring, Die Harmonielehre des Klaudios Ptolemaios (Göteborg, 1930). A German translation can be found in Düring, Ptolemaios und Porphyrios über die Musik (Göteborg, 1934). There is no English translation, though I have begun preparing one. All references to Ptolemy refer to the page and line number in Düring's edition.
- 3. There are four kinds of musical ethos discussed by the Greeks: (1) the three types of melodic ethos discussed in this paper—the diastaltic, systaltic, and hesychastic (or medium); (2) the more commonly known forms of "harmonic" ethos which correspond to the seven harmoniai—Dorian, Lydian, Phrygian, Hypodorian, Hypophrygian, Hypolydian, and Mixolydian; (3) the three types of generic ethos which correspond to the three genera—diatonic, chromatic, and enharmonic; (4) rhythmic ethos. Aristides Quintilianus (10. 13–14) mentions ethos as the fifth type of difference between notes, but this ethos does not correspond to an emotional state.
- 4. Bryennius actually discusses ethos two times, at 362. 19-20 and at 122. 2-3. The passages are identical; both repeat the exact words of Cleonides.

vague,<sup>5</sup> let us for the moment assume the definitions of Aristides and Cleonides (= Bryennius) to describe the same emotions (ethe). The most immediate problem then becomes the very term διασταλτικός.

The manuscript traditions are quite confused and confusing in reporting this term. In the Aristides Quintilianus tradition, at 30. 13 all the important manuscripts offer the reading  $\delta\iota a\sigma\tau a\tau\iota\kappa\dot{\eta}\nu$ , with the exception of those Cleonides manuscripts which include interpolations from Aristides. These Aristides interpolations read  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa\dot{\eta}\nu$  here at 30. 13, and Possevinus emended this  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa\dot{\eta}\nu$  to  $\delta\iota a\sigma\tau a\tau\iota\kappa\dot{\eta}\nu$ . Winnington-Ingram includes these readings in his apparatus, and he adds Bryennius'  $\delta\iota a\sigma\tau \eta\mu a\tau\iota\kappa\dot{\eta}\nu$ . Aristides again uses the term at 40. 15. There, however, all the manuscripts read  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa\dot{\phi}s$ . Winnington-Ingram nonetheless prints  $\delta\iota a\sigma\tau a\tau\iota\kappa\dot{\phi}s$  and suggests, in the apparatus criticus, that the reader compare 30. 13, the passage just discussed here.

The Cleonides manuscripts offer even less security. The word is mentioned at 206. 4 and 206. 6. At 206. 4 only one, relatively inferior, manuscript reads  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa o\hat{v}$ , while the others read  $\delta\iota a\sigma\tau a\tau\iota\kappa o\hat{v}$ ,  $\delta\iota a\sigma\tau\eta\tau\iota\kappa o\hat{v}$ ,  $\iota$  and  $\delta\iota a\sigma\tau\eta\mu a\tau\iota\kappa o\hat{v}$ . At 206. 6 Jan prints  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa o\hat{v}$  but gives no source for his reading. All the manuscripts read  $\delta\iota a\sigma\tau\eta\mu a\tau\iota\kappa o\hat{v}$  or  $\delta\iota a\sigma\tau a\tau\iota\kappa o\hat{v}$ , and it is Meibom who reads  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa o\hat{v}$ ; he cites Vulcanius, the scribe of another inferior manuscript.

- 5. See Pl. Resp. 397-99; Arist. Pol. 1340-41; Lucian Harm. 1. 10-12; and pseudo-Plutarch De mus. passim. See also n. 35.
  - 6. These important manuscripts are Winnington-Ingram's V, N, R, F, and d.
- 7. Jan failed to recognize this group (qua-group) of Cleonides manuscripts, though he does recognize the interpolations in Vulcanius' manuscript—Lugdunensis Perizonianus F. 41 (olim Lugdunensis 135)—and in the manuscript—Vaticanus gr. 1341—which Antonius Possevinus used for his edition of the treatise ("Euclidis Musica," Bibliotheca de Ratione Studiorum II (Venice, 1603), pp. 260-72). This group, here designated as q-group, consists of six manuscripts, three of which are attributed to Cleonides, three to "Anonymous." They all include interpolations from Aristides Quintilianus at 185. 15 (= Aristides 8. 3-9. 12), 186. 21 (= Aristides 9. 15-10. 15), 190. 11 (= Aristides 12. 6-12. 8), and 207. 7 (= Aristides 28. 10-30. 17). These manuscripts also include several interpolations from Bryennius. The exact relation to and reflection of Aristides' original text is hard to determine from these interpolations.
- 8. But no matter which form Wallis printed in his late seventeenth-century edition of Bryennius, the Bryennius manuscripts actually vary greatly at Bryennius 362. 19–24; six have διαστατικήν, eight have διαστηματικήν, and Jonker prints διαστα(λ)τικήν. The six reading διαστατικήν are (Jonker's abbreviations) R, Ma, Mb, Pc, La, and Lb. Those reading διαστηματικήν are Va, H, Pa, Oa, Om, Mc, N, and Am.

Comparing the two Aristides passages, one finds that even the Aristides manuscripts themselves cannot agree on the precise term, for in one passage (40. 15) they unanimously read διασταλτικὸs and in the other (30. 13) they unanimously—with the exception of the Cleonides manuscripts—read διαστατικὴν. Similarly, the Aristides tradition differs as to the term used to describe the "systaltic" ethos, VNM reading  $\sigma u \sigma \tau a \lambda \tau \iota \kappa \dot{\eta} \nu$  and FR reading  $\sigma u \sigma \tau a \tau \iota \kappa \dot{\eta} \nu$ ; as all concur on διασταλτικὸs at 40. 13, so do they concur with  $\sigma u \sigma \tau a \lambda \tau \iota \kappa \dot{\sigma}$ s at 40. 15.

- 9. I follow Jan here, but he neglected to examine seven codices, including Vaticanus gr. 2338, which includes two superior versions of the treatise.
  - 10. L (Lipsiensis gr. 25).
  - 11. M (Venetus Marcianus VI/3, twelfth century), Jan's most valuable manuscript.
- 12. This reading is found in a number of manuscripts, including significantly those manuscripts which alone contain the Aristides interpolations.
- 13. MLW read διαστηματικόν, and NB read διαστατικόν. Jan uses "B" for a codex which contains two different versions of the treatise, with pp. 311–18 attributed to Cleonides, pp. 300–310 to Pappus.
- 14. Lugdunensis Perizonianus F. 41; cf. n. 7. Again there are textual difficulties with the "systaltic" ethos, BM<sup>3</sup>L reading συσταλτικόν and M<sup>1</sup>W reading συστατικόν.

In Ptolemy only one manuscript, Vaticanus gr. 176 (Düring's A), preserves διασταλτικά; the rest and Düring read διαστατικά.

The manuscript traditions of Aristides, Cleonides, Ptolemy, and Bryennius have proved themselves hopelessly confused in their preservation of this term, and so paleographical research must now yield to musicological and semantic. While there is no evidence that a word διαστητικός (read by the valuable twelfth-century M in the Cleonides tradition) existed, the other three variants, διασταλτικός, διαστηματικός, and διαστατικός, are all attested in other authors. Διαστηματικός is found elsewhere in Aristides as well (101. 4, 5. 26), but there it has no connection with a type of ethos; it is only an adjective referring to "intervals," for διάστημα is an extremely common, rudimentary musicological term meaning "interval." The adjective διαστηματικός can also be found in the musicological treatises of Ptolemy (100. 29) and Aristoxenus (13. 21 da Rios). Archytas (1), Porphyry (Sent. 44), Apollonius Dyscolus (Pron. 57. 10), and Philo Mechanicus (Bel. 2. 184) also use the term in a nonmusicological sense.

Διασταλτικόs is found only in the passages cited here (perhaps), and in Apollonius Dyscolus (Adv. 185. 10 and Pron. 24. 12). Διαστατικόs is found in a musicological sense at Ptolemy 29. 2 and perhaps at 106. 14; Düring reports the reading at 29. 2 as secure, but that at 106. 14 has a lectio varia. The term also has this meaning in Nicomachus (282. 6 Jan) as well as in Timaeus Locrus (100E) and Plutarch (Mor. 952B and Pomp. 53).

The meaning of  $\delta \iota a \sigma \tau \eta \mu a \tau \iota \kappa \delta s$  is evident from its derivation. In each nuance discussed in LSJ, it refers to an "interval," be it a musical interval, a distance of space, or a geometrical (radius) dimension. That a word with such musicological significance should find its way into the treatises of

<sup>15.</sup> To be sure, at 362. 19-20 one finds in Jonker's apparatus διαστατικήν and διαστηματικήν. The same manuscripts also consistently read the same variants at 362. 23 and 362. 24 with a few exceptions.

<sup>16.</sup> At 362. 19 he shows his frustration by announcing in his apparatus, "scripsi dubitans utrum codd. meliores (et A.Q. W.-I.) sequar an Wallisii atque Jani auctoritatem (cf. supra ad. p. 122.2sq)." At 122. 2 (and 122. 3) Bryennius again quotes Cleonides and all the Bryennius manuscripts have διαστηματικοῦ, but Jonker follows Wallis and Jan in writing διασταλτικοῦ (-κὸν); he questions Winnington-Ingram's (30. 13) διαστατικὴν. "A.Q. W.-J. [sic] p. 30. 13 scr.—στατικὴν (= disintegrating(?) cf. L.S.J. s.v.)."

<sup>17.</sup>  $\Delta\iota\dot{\alpha}\sigma\tau\eta\mu\alpha$  ("interval") is essentially the difference between two notes  $(\phi\theta\delta\gamma\gamma\sigma\iota)$ . The Aristoxenians recognized intervals smaller than the whole tone—diesis (quarter tone and third tone) and hemitone—and larger—trihemitone, ditone, dia tessaron (two and one-half tones), dia pente (three and one-half tones), tetratone, pentatone, and the dia pason (six tones), and so on. For major discussions of  $\delta\iota\dot{\alpha}\sigma\tau\eta\mu\alpha$ , see Aristides Quintilianus 10. 16–12. 14; Bryennius 98. 9–102. 22; Cleonides 187. 3–189. 8; Aristoxenus 21. 17–22. 3 da Rios; Theon of Smyrna 3; Martianus Capella 948–53; Anonymous Bellermann 22, 58; Nicomachus 12; and Gaudentius 3.

<sup>18.</sup> For Aristoxenus, see R. da Rios, Aristoxeni "Elementa harmonica" (Rome, 1954). No doubt Aristoxenus had discussed these ethical matters, whence their appearance in Cleonides and Aristides (and Ptolemy), but most of his musicological works are lost.

Aristides, Cleonides, and Bryennius is not at all surprising. It is certainly a lectio facilior; any scribe with a reasonable amount of musicological knowledge could have written it absentmindedly, while a scribe with no musicological background could have inserted it since it was a more familiar term, that is,  $\delta\iota\dot{\alpha}\sigma\tau\eta\mu\alpha$ , which he had seen earlier in his copying. In addition to this common method of paleographical reasoning, one can also point out that a musical ethos cannot be "intervallic." The names of the ethe refer to feelings, not musical constructions; in Cleonides, Bryennius, and Aristides,  $\sigma \nu \sigma \tau \alpha \lambda \tau \iota \kappa \dot{\sigma} \nu$  ("depressing") and  $\dot{\eta} \sigma \nu \chi \alpha \sigma \tau \iota \kappa \dot{\sigma} \nu$  ("soothing") are the types of names given to ethe. If nonemotional names are given, they are geographical—Dorian, Lydian, Phrygian, Aeolian, Ionian—or at least generic—diatonic, chromatic, enharmonic—but not constructional.

Jonker questioned the meaning of διαστατικόs, "disintegrating," given in LSJ, which states that the adjective derives from διάστασις and pertains only to "discord"; in Plutarch Pompey 53 its connection with λόγοι necessitates the meaning "causing discord," and the same meaning is found in Nicomachus 282. 6 Jan. The ethos which causes "magnificence and heroic deeds" can certainly not be the same one which "causes discord." In the 1968 Supplement to LSJ, however, there is a new offering, "exciting, exalting," found in Ptolemy 1. 12, 3. 11, and in Cleonides 13 (= 206. 4-5). This definition is incorrect. LSJ has supplied it only because Winnington-Ingram's 1963 edition of Aristides Quintilianus reads διαστατικός at 40. 15 and 30. 13 (= 1. 19 and 1. 12); the translations, "excited, exalted," which will be discussed presently, were used in the earlier LSJ for διασταλτικός. That is, the editors found διασταλτικός to be nothing other than a lectio varia, and so they merely transferred the definition of διασταλτικός from the earlier edition to the definition of διασταλτικός in the Supplement.

With διαστηματικόs belonging clearly to the realm of paleographical error and διαστατικόs having a meaning not at all appropriate to Cleonides' and Aristides' definitions of the word, there is only one alternative remaining, διασταλτικόs. Διασταλτικόs has the basic meaning of "serving to distin-

<sup>19.</sup> This type of error is common in technical treatises, e.g., at Cleonides 190. 2, M reads διάτονον (diatonic) for δίτονον (ditone).

<sup>20.</sup> The συστατικὸs found in the manuscripts of Cleonides and Aristides in all likelihood results, because of their proximity in the texts, from the attraction to διαστατικὸs. Ἡσυχαστικὸs is absolutely secure.

Cleonides (206. 10–14) says the systaltic is the ethos "through which the soul is led toward humility and an unmanly condition" (συσταλτικόν δὲ, δι' οὖ συνάγεται ἡ ψυχὴ εἰς ταπεινότητα καὶ ἄνανδρον διάθεσιν). It is harmonious with "amorous feelings, lamentations, wailings and the like" (ἀρμόσει δὲ τὸ τοιοῦτον κατάστημα τοῖς ἐρωτικοῖς πάθεσι καὶ θρήνοις καὶ οἴκτοις καὶ τοῖς παραπλησίοις). Aristides Quintilianus agrees; for him (30. 12–13) the systaltic ethos is that "through which we move distressing feelings" (δι' ἢς πάθη λυπηρὰ κινοῦμεν).

The hesychastic ethos of Cleonides (206. 14–15) is the ethos which accompanies "tranquillity of the soul and a free and peaceful condition" (ἡσυχαστικὸν δὲ ἦθός ἐστι μελοποιίας ῷ παρέπεται ἡρεμότης ψυχῆς καὶ κατάστημα ἐλευθέριὸν τε καὶ εἰρηνικόν). Hymns, paeans, encomia and the like are used here. Aristides (30. 14–15) calls this third type of ethos the medium (μέσην), and it is through this ethos that "we lead the soul to quietude" (τὴν δὲ μέσην δι' ἢς εἰς ἡρεμίαν τὴν ψυχὴν περιάχουσεν)

<sup>21.</sup> LSJ does not acknowledge variant readings here (διαστατικός) as it does in its supplemental material to διασταλτικός.

guish."<sup>22</sup> As many words in Greek (and English) which originally have the meaning "separate" tend also to have the meaning "superior,"<sup>23</sup>  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa\delta s$  can also take on this meaning. It does so, however, only in the area of musicology; LSJ then offers this second meaning and cites Aristides Quintilianus 1. 12 (= 30. 13) and Cleonides 13 (= 206. 4–5) for the meaning "exciting, exalting."<sup>24</sup> Unfortunately, there is no other citation for this technical meaning of  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa\delta s$  in either LSJ or Stephanus. Stephanus, in fact, merely quotes the passages in Cleonides (attributed at the time to Euclid) under scrutiny here and does not attempt to translate the poorly attested term. LSJ does make this rather bold attempt and hypothesizes "exalting, exciting" from the information given by Aristides and Cleonides, for these two authors say that the diastaltic ethos "arouses the soul" and/or "shows magnificence, manly elevation of the soul, heroic deeds and the like."

Reading Cleonides' definition, one would have to reject LSJ's "exciting" as a definition for  $\delta\iota a\sigma\tau a\lambda\tau\iota \kappa \delta s$ , for noble and heroic qualities are moved by this ethos; Cleonides' diastaltic ethos does not "excite" the human spirit to perform heroic deeds. "Exalting" is more acceptable, for the exalted soul can indeed achieve a feeling of magnificence. But this definition of  $\delta\iota a\sigma\tau a\lambda\tau\iota \kappa \delta s$  nonetheless still falls short of the ideal. The exalted soul does not necessarily perform heroic deeds or become "manly"  $(\dot{a}\nu\delta\rho\hat{\omega}\delta\epsilon s)$  just because of its "elevation"  $(\delta\iota a\rho\mu a)$ . A technical term is best left untranslated when there is little evidence for its precise meaning, but I propose "distinguishing, uplifting" as an English translation which covers Aristides' "arousing," Cleonides' "showing magnificence, manly elevation and heroic deeds," and the etymological "separate, distinguished."

Further suggestions for understanding the full implications of the meaning of  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa\dot{o}s$  arise from investigating the uses and legacy of the verb from which  $\delta\iota a\sigma\tau a\lambda\tau\iota\kappa\dot{o}s$  is derived.  $\Delta\iota a\sigma\tau\dot{e}\lambda\lambda\omega$ , of course, means "to put asunder, expand, separate" (LSJ, I. 1), and many verbs meaning "to separate" again mean "to be superior, excel."  $\Delta\iota a\sigma\tau\dot{e}\lambda\lambda\omega$  has this meaning

<sup>22.</sup> This is the basic meaning of the adjective in Apollon. Dysc. Adv. 185. 10, Pron. 24. 12 and 49. 24, the scholiast to Eur. Med. 334(8), and Eust. 73. 31 and 1610. 3.

<sup>23.</sup> Derivatives of διίστημι, e.g., διαστατικόs and διαστηματικόs, can also (etymologically) refer to "distinguishing, separate"; cf. Diog. Laert. 4. 33. Greek, like English, is wont to stretch this "distinguishing" into "superior, elevated." The usages of διαφέρω (LSJ, III. 4) are a good example, as are διαιρέω (LSJ, III. 1) and διακρίνω (LSJ, I. 3 and II. 1). It is conceivable that "superior, elevated" could be used as the meaning for διαστηματικόs; cf. δγκος καὶ διάστημα [Longin.] 40. 2 (= LSJ, II) with δγκος καὶ δίαρμα in Plut. Mor. 853C or [Arist.] Aud. 800a35 ἐκ πολλοῦ διαστήματος. But this is not an attested meaning for this word. See also W. Rhys Roberts (ed.), [Longinus]: "On the Sublime" (Cambridge, 1899), s.v. διαιρεῖν (pp. 196–97).

<sup>24.</sup> The LSJ 1968 Supplement incorrectly tries to eliminate the word—on account of Winnington-Ingram's 1963 edition of Aristides Quintilianus—as a varia lectio in both Cleonides and Aristides Quintilianus. Moreover, LSJ should have added Aristides 1. 19 in addition to, not instead of, 1. 12 and Cleonides 1. 13.

<sup>25.</sup> Cf. Plut. Mor. 853C; [Longin.] 12. 1; and Diog. Laert. 9. 7.

<sup>26.</sup> Of the translators of Cleonides, Strunk (1950) has "diastaltic," Paul (1872) "diastaltische," Menge (1916) "diastalticus," and Ruelle (1884) "diastaltique." Meibom (1652) and Gregorius (1703) have "distendens," while Pena (1557), Dasypodius (1571), Herigone (1634), and Possevinus (1603) have "Intervallaris," and Forcadel (1566) "intervalarie."

<sup>27.</sup> Cf. n. 23.

in Apollonius Dyscolus (Pron. 39. 1) where it is opposed to ἀπόλυτον είναι, but this is the only citation given in LSJ for this meaning.<sup>28</sup> Another derivative of στέλλω, καταστέλλω, is known to have had "ethical" musicological applications, for example, Sextus Empiricus Adversus mathematicos 6. 19 τῶν μελῶν τὰ μὲν εἶναι διεγερτικὰ τῆς ψυχῆς τὰ δὲ κατασταλτικά and Iamblichus De vita Pythagorica 25. 113. In both examples κατασταλτικός refers to a relaxed and sedate (ethical) quality of music. Obviously the idea behind the use of the root  $-\sigma \tau \dot{\epsilon} \lambda \lambda \omega$  gives the musical compound movement; the preposition gives this movement a direction. Kara-, as seen in the above two examples, is "down,"29 and dia- in composition has a variety of meanings, that used here necessarily meaning "thoroughly" (cf. LSJ, D. IV, V). Perhaps even more to the point is the ubiquitous use of compounds of  $\sigma \tau \dot{\epsilon} \lambda \lambda \omega$ in ancient Greek (and modern English) medical terminology. Διαστέλλω is used to mean the dilation of the lungs ([Arist.] Aud. 800a35), of the heart (Gal. 2. 597), and of the pulse (Gal. 8. 736).30 It is not at all rare for writers in one technical discipline to adopt the vocabulary of another technical discipline for their own use; this is especially true in the peripatetic tradition. The term  $\sigma \dot{\nu} \sigma \tau \eta \mu a$ , for instance, is used by musicologists, metricians, and physicians; and  $\mu \epsilon \tau \alpha \beta o \lambda \dot{\eta}$  is a musicological, military, literary, and political term. Nor is musicological interest in medicine restricted to terminology alone. Aristides (89. 10 and 113. 27) describes the relationship of body and soul by referring to  $ia\tau\rho\hat{\omega}\nu$   $\pi a\hat{\imath}\delta\epsilon s$ , 31 and his entire description of rhythm at 82. 25–26 is filled with medical terminology.<sup>32</sup> Ultimately, it seems that Aristides Quintilianus and Cleonides are describing these musical ethe not in musical terms as much as they are in musicalmedical terms, the result of which is not an intellectual musicological experience, but an emotional-physical (or "musical"-physical) experience. This is why neither Cleonides nor Aristides Quintilianus tries to equate these ethe with those "harmonic" ethe discussed by Plato and Aristotle; the former refer to physical effects, the latter to musicological constructs.<sup>33</sup>

Once this peripatetic musicological-medical connection is manifest, and with the actual meanings of διαστατικός, διασταλτικός, and διαστηματικός

<sup>28.</sup> Its second-century A.D. date could postdate either Ptolemy or Cleonides, although the date of neither is secure.

<sup>29.</sup> The άνα- in άνάσταλσις does not signify "up," but "backwards," e.g., Gal. 12. 664.

<sup>30.</sup> Cf. συστέλλω in Hippoc. VM 22 and καταστέλλω in Diosc. Med. 2. 1. See also B. Meinecke, "Music and Medicine in Classical Antiquity," in Music and Medicine, ed. M. Schullian and M. Schoen (New York, 1948), pp. 76-77. For pointing out this vital connection between musical and medical terminology I am extremely grateful and entirely indebted to the anonymous referee for CP.

<sup>31.</sup> Aristides (83. 21) also relates different rhythms to κινήσεις των άρτηριων.

<sup>32.</sup> Τοιγάρτοι κάν ταις των σφυγμων κινήσεσιν οι διά τοιούτων χρόνων τάς συστο//λάς ταις διαστολαις άνταποδιδόντες θγιεινότατοι.

<sup>33.</sup> We can, despite the lack of detailed information, at least attempt to equate Cleonides' description of the diastaltic ethos with Heracleides Ponticus' (ap. Ath. 624D) description of the ethos effected by the Dorian harmonia ("scale"). Heracleides describes this ethos as ἀνδρῶδες and μεγαλοπρεπές, Cleonides as μεγαλοπρέπεια...δίαρμα ψυχῆς ἀνδρῶδες. The resemblance is obvious. Heracleides then continues to describe the Dorian with other adjectives such as σκυθρωπὸν καὶ σφοδρόν ("sober and vehement"). For this meaning of σκυθρωπός, which normally means "sullen, gloomy," cf. Dem. 45. 68. Arist. Pol. 1340b4 describes the Dorian similarly, calling it "the most steadfast and manly" (περὶ τῆς δωριστὶ... στασιμωτάτης ούσης καὶ μαλιστ' ἦθος ἐχούσης ἀνδρεῖον). [Plut.] De mus. 1136D-F labels the same harmonia as ἀξιωματικόν and σεμνόν.

fully understood, the problematic passages in Cleonides, Aristides, Bryennius, and Ptolemy at once become resolved. The ethos must be the diastaltic, and passages which once contained textual difficulties now must conform to the only conceivable musicological possibility. The major Aristides manuscripts at Aristides 30. 13 must yield their διαστατικόs to the διασταλτικόs of the Aristides-interpolated Cleonides manuscripts. Winnington-Ingram's emendation of διαστατικόs for (all) the manuscripts' διασταλτικόs should be rejected. Bryennius' text should read διασταλτικοῦ (-κὸν) at 122. 2(3) and 362. 23(24) instead of διαστα[λ]τικοῦ (-κὸν), and Jonker's lengthy apparatus notes can be ignored. Jan's text should remain unchanged even though the διασταλτικοῦ at 206. 4 is found in only one somewhat inferior manuscript and even though that at 206. 6 is found only in Vulcanius and thus Meibom (and Jan). Ptolemy's text at 106. 14 should read διασταλτικά as well, especially in conjunction with συσταλτικά at 106. 13.34

We must next briefly investigate the diastaltic ethos as defined by Cleonides and Aristides Quintilianus to see if they do indeed define the same ethos. This investigation is necessary on account of the general inconsistency in the Greek descriptions of ethe. 35 Aristides' definition seems to apply to the medical terminology more closely than does Cleonides' definition, but this does not rule out a close connection between the two authors. Moreover, one should compare the definitions of the systaltic and hesychastic ethe in Aristides and Cleonides.<sup>36</sup> As one might expect from the very name, the systaltic ethos is intended as the polar opposite of the diastaltic ethos in both authors.<sup>37</sup> The hesychastic or medium ethos also seems to be paralleled in both authors despite the variation in terminology.<sup>38</sup> If Aristides' definitions of the systaltic and hesychastic ("medium") so closely resemble those of Cleonides, then it would seem that Aristides intended his rather simple definition of the diastaltic ethos to mean the same as Cleonides' more elaborate definition. Nonetheless, one still must use caution here. Cleonides and Aristides apparently used the same source. but there is still some difficulty in explaining away the difference in phrasing and emphasis.

It still seems that the three *ethe* of Aristides and Cleonides (and Bryennius) are not in any way intended to correspond to any specific three of the seven basic *harmoniai*.<sup>39</sup> The imprecision of definition and the plurality of

<sup>34.</sup> Also, Ptolemy's third ethos, the middle (τὸν μεταξύ...) relates to Aristides' μέσην.

<sup>35.</sup> Heracleides (ap. Ath. 625B), for example, describes the Hypophrygian as "harsh and rough" (σκληρὸν καὶ αὐστηρὸν) while Lucian (Harm. 1. 10–11) labels it "subtle" or "elegant" (γλαφυρόν). In a rather infamous discrepancy, Plato (Resp. 398E) labels the Lydian harmonia as "soft" and "convivial" (μαλακόν, συμποτικόν), while his Stagirite pupil (Pol. 1342b32) maintained that it was the ideal, orderly harmonia with which to educate a young lad (διὰ τὸ δύνασθαι κόσμον τ' ξχειν καὶ παιδείαν). Apparently the "mood" of a harmonia was a matter for subjective interpretation.

<sup>36.</sup> Given supra, n. 20.

<sup>37.</sup> It corresponds to the ethos evoked either by Plato's Mixolydian harmonia (Resp. 398Ε θρηνώδης ["lamenting"]) or his Lydian (μαλακόν ["soft"]).

<sup>38.</sup> They correspond most closely to the "soft" Lydian of Plato.

<sup>39.</sup> Cleonides does not acknowledge the existence of the harmoniai; for him the Dorian, Lydian, and Phrygian are tones (τόνοι οτ τρόποι). Aristides is more interested in antiquarian matters.

opinions about the ethos of many harmoniai make such a correspondence impracticable. The ethe described in Plato's Republic, Aristotle's Politics, Heraclides, pseudo-Plutarch, and Lucian are categorically specific ethe (however vague their description) to be attached to specific harmoniai, that is, scales, melodic phrases, and cadences. They are technical musicological constructs which produce vague, emotive responses. The three ethe described by Cleonides, Aristides, and Bryennius are in contrast physicalmusical descriptions, general descriptions of physiological and therefore emotional states caused by vague types of melodies. In the harmonic ethe the reactions are vague, the music specific; in the melodic ethe, the music is vague and the reaction specific. 40 That Cleonides tells us that the diastaltic ethos was suitable for the lyrics of tragedy does not delineate more finely the musical range of this ethos, for pseudo-Plutarch (1136C-1137 A) reminds us that the Mixolydian (lamenting) was suitable for tragedy as were the Dorian, Lydian, and Ionian. If pseudo-Plutarch is offering us reliable information here, then Cleonides was much too vague in assigning the diastaltic ethos to tragedy. Tragedy contains more than "magnificence"; it contains lamentations as well, and in this instance the systaltic ethos should have corresponded to tragedy as well according to Cleonides' (and Bryennius') definition. Cleonides did not make it correspond, however, and once again an ancient Greek musicologist has shown modern scholarship that his reliability so far as music of "classical" Greece is concerned is suspect.

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<sup>40.</sup> Even so, if the systaltic ethos is appropriate for love, lamentations, wailing, and the like, then only the Mixolydian harmonia described by Plutarch (De mus. 1136D), Aristotle (Pol. 1340b), and Plato (Resp. 398E) could evoke this melodic ethos. The plaintive and lamenting Mixolydian might also be used to evoke the hesychastic of middle ethos, though the soft Lydian of Plato seems more "middle" of the road and peaceful than the emotional Mixolydian. The diastaltic ethos, however, with its  $\mu\epsilon\gamma$  alongé  $\pi\epsilon$  could correspond to either the Dorian of Heracleides, pseudo-Plutarch, and Aristotle, or to the majestic Hypodorian of pseudo-Aristotle, or possibly, following Aristides' definition, to the rousing Phrygian of Aristotle, and perhaps even to the exciting, bacchic Hypolydian.



 $KATA\Lambda H\Psi I\Sigma\text{-}A$  Neglected Technical Term in Greek Music

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## KATAΛΗΨΙΣ—A NEGLECTED TECHNICAL TERM IN GREEK MUSIC

Σω. ἥκιστ' ἀλλ' οὐράνιαι Νεφέλαι μεγάλαι θεαὶ ἀνδράσιν ἀργοῖς· αἴπερ γνώμην καὶ διάλεξιν καὶ νοῦν ἡμῖν παρέχουσιν καὶ τερατείαν καὶ περίλεξιν καὶ κροῦσιν καὶ κατάληψιν.

Aristophanes, Nub. 316-18.

The Scholia on these lines provide divergent interpretations of the abstract nouns, one of the notes on κατάληψω reading as follows: κατάληψω δὲ εἰώθασω οἱ μουσικοὶ λέγεω ἐπειδὰν πλήξαντες τοῖς δακτύλοις ἢ τῷ πλήκτρῳ τὰς χορδὰς καταλάβωσι καὶ ἀποτείνωσι τὸν φθόγγον.

A slightly different version of this scholium appears in Suidas, s.v. κατάληψις: μουσικῶς δὲ ταῦτα εἶπε. λέγουσι γὰρ κατάληψιν ἐπειδὰν καταλάβωσι τῷ πλήκτρῳ ἢ τοῖς δακτύλοις τὰς χορδὰς πλήξαντες, ὡς καὶ ἀποτείνεσθαι τὸν φθόγγον.

Although this technical meaning of  $\kappa a \tau \dot{a} \lambda \eta \psi s$  is duly recorded in the lexica, I am unaware that it has ever been noticed in works specifically devoted to Greek music or the technique of lyre and kithara. Clearly if the statement in the scholia has any authority<sup>2</sup> it is of great interest for so controversial a subject.

Before considering the nature of the technique here mentioned we should be quite clear what is meant by  $\phi\theta\delta\gamma\gamma\sigma\nu$   $d\pi\sigma\tau\epsilon\ell\nu\epsilon\nu\nu$ , as it is implied in schol. Nub. and stated unequivocally in Suidas that this is the result of  $\kappa\alpha\tau\delta\lambda\eta\psi\iota$ s. Now  $d\pi\sigma\tau\epsilon\ell\nu\epsilon\nu\nu$  in a musical or acoustical context means 'to prolong a sound, to cause a sound to resonate', as is clear from the following passages:

Plato, Prot. 329 a ἀλλ' ἐάν τις καὶ σμικρὸν ἐπερωτήση τι τῶν ἡηθέντων, ὥσπερ τὰ χαλκία πληγέντα μακρὸν ἠχεῖ καὶ ἀποτείνει ἐὰν μὴ ἐπιλάβηταί τις, καὶ οἱ ἡήτορες οὕτω σμικρὰ ἐρωτηθέντες δόλιχον κατατείνουσι τοῦ λόγου.<sup>3</sup>

<sup>1</sup> Cf. L.S.J., s.v. κατάληψις ii. 3—'in Music, stopping of the strings of an instrument'. Older editions oddly rendered 'a touching of the strings to see that they are in tune'. The term for this acc. to Schol. Pind. Ol. 9. 59 was ὑποκρέκειν. (ὑποκρέκειν γὰρ κυρίως ἐστὶ τὸ ἠρεμαίως ὑπηχεῖν ἐν τῷ ἀρμόζειν τὴν κιθάραν . . . πρότερον γὰρ τῆς κιθάρας ἐφαπτόμενοι ὑποκρέκουσιν.) But much of this scholium is far from clear.

<sup>2</sup> The schol. is not found in R or V, and I have no evidence for its appearance in any specific manuscripts before it gained currency from the Aldine edition. Clearly, however, Suidas' entry is based on a *Clouds* schol. and there is no case for dismissing it as a mere invention of a later age to explain a word of uncertain meaning, particularly if other evidence from antiquity can be adduced for a musical application of  $\kappa a \tau a \lambda a \mu \beta a \omega \omega$ .

<sup>3</sup> For ἐπιλαμβάνειν = καταλαμβάνειν υ.

infra. Μακρον λόγον ἀποτείνειν (and the like) is of course a commonplace. Cf. also Plut. Sulla 7 φωνή σάλπιγγος όξὺν ἀποτείνουσα καὶ θρηνώδη φθόγγον. In Ar. de An. 420b8 αὐλὸς καὶ λύρα καὶ ὄσα ἄλλα τῶν ἀψύχων ἀπότασιν ἔχει καὶ μέλος καὶ διάλεκτον, the meaning is 'instruments capable of sustaining a uniform sound of definite pitch'. (Trendelenburg, ad loc., says it includes both ἐπίτασις and ανεσις; Hicks translates 'pitch' or 'register' but it is not so much the pitch as the quality of sound which is referred to. Appeal to Aristox. Harm. 1. 10 on the ground that ἀπότασις is used like ἐπίτασις there is not really relevant—Aristoxenus is distinguishing ἐπίτασις and ἄνεσις in the usual way with reference to pitch, whereas ἀπότασις is a neutral word. Cf. Ar. H.A. 545<sup>a</sup>17 (ζώων) ὄσων ἔστιν ἀπότασις τῆς φωνῆς—'where the voice admits of a continuous and prolonged sound', D'Arcy Thompson correctly.) The Life of Sophocles includes among its fabulous

Plut. Mor. 721 b δρậς γὰρ ὅτι καὶ τῶν ἀγγείων τὰ κενὰ πληττόμενα μᾶλλον ὑπακούει ταῖς πληγαῖς καὶ τὸν ἦχον ἀποτείνει μακράν. Ι

If therefore the schol. and Suidas state the facts correctly, κατάληψις must mean the seizing or 'stopping' of the string in such a way that the sound is prolonged. We must also bear in mind the important fact that the κατάληψις occurs after striking the string (πλήξαντες aorist).

Now the stopping of a string in modern parlance means the alteration of the vibrating length of a string by pressure of the finger in order to raise the pitch of the note, and followers of Sachs and Gombosi might well be excited if this literary evidence could be adduced in support of their assumption that a similar technique of finger-stopping (or, as Gombosi preferred, of increasing tension by pressure on the non-sounding part of the string below the bridge) was fundamental to performance on the Greek kithara. But in such a procedure the player surely must prepare his string length before, or at most in the act of striking or plucking, which interpretation is precluded by the aorist participle  $\pi \lambda \dot{\eta} \xi a \nu \tau \epsilon_s$ . Nor is  $\dot{\alpha} \pi o \tau \epsilon \dot{\nu} \nu \epsilon \nu$  in view of the parallels cited likely to be used like  $\dot{\epsilon} \pi \iota \tau \epsilon \dot{\nu} \nu \epsilon \nu$  of increasing the tension of the string and pitch of the note, and a stopped note is in fact less resonant than that of an open string.

A second possibility is suggested by the description of the playing of the traditional Chinese *ch'in* given by Sachs.<sup>5</sup> 'The right hand plucks while the left hand taps the strings at a certain spot and glides to the following position without leaving the string and without lessening the pressure. If both hands

anecdotes of the poet's death the story that he choked himself in reading a passage from the Antigone without pausing for breathάγαν ἀποτείναντα τὴν φωνήν (codd.), and I see no cause to alter to ἐπιτείναντα with Nauck and Pearson: duration, not pitch, was involved in this ill-fated recitation. Cf. πνευματικώς ἀποτείνεσθαι of declaiming a passage in a single breath in Hermog. Inv. 4. I. [Ar.] Physiogn.  $806^{b}26$  is puzzling— $\epsilon \pi i$ δὲ τῆς φωνῆς ἡ μὲν βαρεῖα καὶ ἐπιτεινομένη ἀνδρεῖον. As ἐπιτείνειν in music is consistently associated with raising tension of strings and pitch of notes it is surprising to find it combined with βαρύς of the male voice. The translators render it 'deep and full voice', etc. ἀποτεινομένη would appear more apposite to the meaning 'resonant', but perhaps the familiar contrast with ἀνείμενος (ή δὲ ὀξεῖα καὶ ἀνειμένη δειλόν) confirms the reading, in which case the words are dissociated from high and low pitch as such. This is a familiar problem to those who have studied the controversial matter of the σύντονοι and ἀνειμέναι άρμονίαι, where the use of the terms frequently suggests an 'ethical' rather than musical connotation. Cf. Mountford in J.H.S. xl (1920), 23-24.

The similarity of expression here suggests that  $d\pi \sigma \tau \epsilon i \nu \epsilon \iota$  in the *Protagoras* passage is not, strictly speaking, used absolutely, as Adam thought.

<sup>2</sup> Note that διάληψις is so used in Ar. Pr. 19. 12 of producing an octave note by halving the vibrating length of the string. This

probably refers to monochord experiments (cf. Theon Smyrnaeus, p. 59. 22 Hiller).

- <sup>3</sup> For an account of the views of these scholars and a description of the alternative techniques proposed, see the article by R. P. Winnington-Ingram in C.Q. vi (N.S. 1956), especially pp. 169 and 183–6, where he demonstrates certain difficulties inherent in their assumptions. Finger-stopping on the kithara had been assumed on the basis of the difficult passage in Plato, Phlb. 56 a by J. Curtis in J.H.S. xxxiii (1913), 37. I am indebted to Professor Winnington-Ingram for his advice in preparing this article.
- 4 This objection applies also to an interpretation suggested to me by D. Mervyn Jones, that καταλαμβάνειν (literally = 'seize or grip', not merely 'stop') might refer to the violent pulling or plucking of the string to produce increased amplitude of vibration and resonance. Cf. [Ar.] De Aud. 803a30 κάν τις άπτηται τῶν χορδῶν ταῖς χερσὶ βιαίως καὶ μὴ μαλακῶς, ἀναγκὴ καὶ τὴν ἀνταπόδοσιν αὐτὰς οὖτω πάλιν ποιεῖσθαι βιαιοτέραν. (There follow observations on the different tone achieved by plucking at different points of the string.) Forsyth (Orchestration, p. 466), writing of the harp, says: 'The string needs to be plucked a fair distance from the vertical if it is to produce a good tone.'
- <sup>5</sup> The History of Musical Instruments, p. 188. This instrument corresponds to the Japanese koto, the technique of which Gombosi also postulated for the kithara.

play on the same string, the left hand action stops the plucked string but is separately audible as a series of vibratos, glissandi and dull beats.' But again καταλαμβάνειν does not seem an appropriate word for describing the light touch required for this sophisticated procedure. Thirdly, one might think of the production of harmonics (for which there is some slight evidence in the literature<sup>1</sup>) through the partial stopping of the open string with the left hand, but neither verb is specially appropriate to describe such an operation.

In fact I have been able to discover only one instrumental technique which seems to follow the series of activities mentioned in the three verbs of the scholium  $\pi\lambda\dot{\eta}\xi\alpha\nu\tau\epsilon_S$ —καταλάβωσι—ἀποτείνωσι. This is a species of melodic ornamentation used by players of the Indian vînâ and described as follows by Arnold Bake.2 'One way of creating these ornaments is to pull the string sideways with the fingers of the left hand after it has been vigorously struck and thus to vary the tension, producing various śrutis (i.e. microtones) as long as the vibration lasts.' Even here a rise of pitch after the first striking of the note would be more appropriately described by  $\epsilon \pi \iota \tau \epsilon i \nu \epsilon \iota \nu$ , supposing this technique were ever used on the kithara.3

I am more inclined to think that  $\kappa \alpha \tau \alpha \lambda \alpha \mu \beta \acute{a} \nu \epsilon \nu$  in the scholium means not 'stopping' in the modern sense but 'damping'. The kitharist after striking the string with the fingers of his right hand, or with the plectrum, stops the vibration with his left hand in order to articulate the notes more clearly or to produce a staccato effect, the sons étouffés of modern harp-playing. Such a left-hand technique has often been assumed from the artistic convention in vase-painting which shows the fingers of the left hand outspread on the strings after the right hand has apparently struck or plucked them, and also from the observation of such a technique in other civilizations.<sup>4</sup> Thus schol. Nub. 318 might be said to provide the 'positive evidence' for this relationship of the hands which Winnington-Ingram queried in a recent article.<sup>5</sup> That this is the most natural meaning for the verb in an acoustical context is confirmed by at least three passages. In Plut. Mor. 721 d (the sequel of the passage already quoted) it is used of deadening the sound of a ringing bronze vessel (... μέχρι ἂν ἁψάμενός τις ὤσπερ ἐν ὁδῷ καταλάβη καὶ τυφλώση τὸ κένον). Dionysius (Comp. ch. 22. 166-7) uses it twice of stopping the voice in the articulation of words in which certain letters follow one another  $(\delta \epsilon \hat{\imath} \ \delta \hat{\epsilon} \ \tau o \hat{\imath} \ \bar{\sigma} \ \sigma \iota \omega \pi \hat{\eta} \ \kappa \alpha \tau \alpha \lambda \eta \phi \theta \hat{\epsilon} \nu \tau o s \ \tau \hat{\sigma} \tau \hat{\sigma}$ άκουστον γενέσθαι το ξ).

Most important is [Ar.] Pr. 19. 42, where the question is asked  $\delta\iota\dot{\alpha}$   $\tau\dot{\iota}$ ,  $\dot{\epsilon}\dot{\alpha}\nu$ τις ψήλας την νήτην ἐπιλάβη, ἡ ὑπάτη μόνον δοκεῖ ὑπηχεῖν; 'Why is it that if one plucks the string giving nete and then stops it, hypate (i.e. the note an octave below) appears to respond?' That the acoustical phenomenon referred to here (and in Pr. 24) is the reverse of the readily recognizable perception of overtones

- <sup>1</sup> See, for example, Düring in Eranos, xliii (1945), 196, and the innovations ascribed to Lysander of Sikyon in Ath. 14. 638 a.
- <sup>2</sup> The New Oxford History of Music, i. 223-4. Similarly Sachs (Rise of Music in the Ancient World, p. 182) writes of 'a wail by deflecting the string right after plucking'. Cf. also A. H. Fox Strangways, The Music of Hindostan, pp. 182-3.
  - <sup>3</sup> Unless ἀποτείνειν could mean 'stretch

out of tune', as  $d\pi \dot{q} \delta \epsilon \omega = \text{sing out of tune}$ (as Mr. J. G. Landels has suggested to me). This is ingenious, but I doubt if the verb would be used in a musical context outwith its normal signification.

<sup>4</sup> Cf. Sachs, op. cit., pp. 132-3.

<sup>5</sup> Loc. cit., p. 183. The author prefers to see in this artistic convention the plucking of the strings with the left hand. I do not mean to deny that it was also used for plucking, for which there is ample evidence.

does not concern us. There is much that is obscure in the rambling answer given, the general purport of which relates to what we call the sympathetic vibration of consonant strings, and which was naturally familiar to Greek musicians. But the explanation of the apparent sounding of the hypate string includes the word ἀκατάληπτος, τοὶς τὴν μὲν γὰρ νεάτην ἴσμεν ὅτι οὐ κινεῖται ἐπιληφθεῖσα, τὴν δὲ ὑπάτην αὐτὴν ὁρῶντες ἀκατάληπτον οὖσαν καὶ φθόγγον αὐτῆς ἀκούοντες, ταύτην οἰόμεθα ἢχεῖν. Hypate, unlike nete, is not damped by finger pressure. It is not clear whether any distinction (e.g. of pressure) is implied between ἐπιλαμβάνειν and καταλαμβάνειν.²

But if this is the meaning of  $\kappa \alpha \tau \dot{\alpha} \lambda \eta \psi \iota s$  and  $\kappa \alpha \tau \alpha \lambda \dot{\alpha} \beta \omega \sigma \iota$  in schol. Nub., the damped string could in no sense be said to resonate, and we are left with the problem of  $\kappa \alpha \dot{\iota} \dot{\alpha} \pi \sigma \tau \dot{\epsilon} \iota \nu \omega \sigma \iota$ . The alternatives are (1) that the scholiast has not properly understood some text relating to the damping of strings and that the error is repeated in the rephrased entry in Suidas, or (2) that the words have suffered some corruption in transmission which was present already in a common ancestor of both schol. Nub. and Suidas. Winnington-Ingram suggests the remedy of reading  $\kappa \alpha \dot{\iota} \langle \mu \dot{\eta} \rangle \dot{\alpha} \pi \sigma \tau \dot{\epsilon} \iota \nu \omega \sigma \iota$ , or alternatively  $\dot{\alpha} \pi \sigma \tau \dot{\epsilon} \mu \nu \omega \sigma \iota$  or  $\dot{\alpha} \pi \sigma \tau \dot{\epsilon} \mu \omega \sigma \iota = cut off$  the sound.

There remains one other important piece of evidence relating to this function of the left hand in string playing. Quintilian (*Inst. Or.* 1. 12. 3) discussing the ability to engage in a number of simultaneous activities, draws an analogy from singing to the kithara: 'An vero citharoedi non simul et memoriae et sono vocis et plurimis flexibus serviunt, cum interim alios nervos dextra percurrunt, alios laeva trahunt, continent, praebent.' In this distribution of the functions of the hands in playing the kithara it cannot be said that the sense of the last three verbs is certain. 'Pluck, damp, release' is the usually accepted meaning, and the first two are doubtless correct although *trahere* is hard to parallel in preference to the usual *carpere*. \*\*Continere\* is unlikely to refer to alteration of length and tension of the string in the course of playing. Thus far the Quintilian citation closely parallels the *Clouds* scholium—the striking with the

- <sup>1</sup> L.S.J.'s 'that cannot be reached or touched' in citing this passage is surely wrong.
- <sup>2</sup> Perhaps  $\epsilon \pi \iota$  means to press on top of the string, κατα- to pinch it between two fingers. For ἐπι- cf. Plato, Prot. 329 a quoted above, and Plut. Mor. 995 f: τῶν χαλκωμάτων τὰ λεπτὰ τοὺς ψόφους ἐν κύκλῳ διαδίδωσιν ἄχρι οὖ ἐμφράξη καὶ τυφλώση τις τῆ χειρὶ τῆς πληγης περιφερομένης ἐπιλαμβανόμενος (cf. καταλαμβάνειν in the similar context of Mor. 721 d). The verb is used in Theo Smyrnaeus, p. 71. 7 Hiller of the movable bridge of the monochord cutting off part of the string; in [Ar.] De Aud. 804215 of closing the speaker hole (?) of the aulos. Cf. the common use of stopping the flow of water in the clepsydra. Some medical uses of καταλαμβάνειν (stopping πνεῦμα, etc.) may be consulted in L.S.J. Cf. especially Ar. de Somn. 455<sup>b</sup>7 έτι δ' οἱ τὰς ἐν τῷ αὐχένι φλέβας καταλαμβανόμενοι ἀναίσθητοι γίνονται.
  - <sup>3</sup> Suggested also independently to me by

Mervyn Jones. Aor. subj. ἀποτέμωσι (parallel to καταλάβωσι) might have engendered the corruption more readily. The closest parallel I can find of ἀποτέμνειν used metaphorically of cutting short sound is in Aristid. Quint., p. 30. 11 Jahn where it is used of shortening a long vowel in hiatus: της τοῦ καθηγουμένου τόνου μακρότητος ἀποτέμνεται. φθόγγον ἀποτέμνειν in Ptol. Harm., p. 88. 10 Düring is used in the familiar sense of dividing string lengths on the monochord (cf.  $\dot{a}\pi o \tau o \mu \dot{\eta}$  of the difference between the  $\lambda \epsilon \hat{i}\mu\mu a$  and  $\tau \acute{o}\nu os$  in Gaudentius, pp. 343, 344 Jan.). φθόγγον  $\vec{a}\pi o \tau \epsilon \lambda \epsilon \hat{\imath} \nu$  is a commonplace in the musical writers, but always in the general sense of producing sound rather than the literal sense of bringing the sound to an end.

4 Trahere happens to be used of nervi (sinews) in Lucr. 6. 1190, where the sense is 'to contract'. Tractare in Ovid (Am. 1. 8. 60: tractat inauratae consona fila lyrae) is of more general reference than trahunt in this context.

plectrum (in right hand), plucking with fingers (of left hand, according to Quintilian), the stopping of the vibration. *Praebent*, however, is most obscure, and the explanation mentioned by Colson<sup>2</sup> in his edition of Book 1 that 'by removing the finger the string in its natural condition is offered to the right hand' (i.e. for striking again) seems something of a subterfuge in order to extract the meaning 'release' from a verb which is unclear in itself and does not impress as a probable technical term. *Praebent* is in fact probably corrupt.<sup>3</sup> Prohibent suggests itself readily after continent, and while one hesitates to use one emendation to confirm another, it is at least remarkable that this would produce the same series of activities as schol. Nub. describes if  $\dot{\alpha}\pi\sigma\tau\dot{\epsilon}\mu\omega\sigma\iota$  be restored there—the string is plucked, damped, and the sound cut off.

So far I have examined the scholium in isolation from the text which it presumes to illuminate, but the question may be asked, has it any relevance to the interpretation of the line, and was κατάληψις a technical term of lyre playing in the fifth century? Now it may be said first that if the musical meaning were totally irrelevant to line 318 of the Clouds, it is curious that this rather recherché technical meaning was ever attached to a note which otherwise interpreted the word conventionally enough by ευρεσιν, or την γνωσιν καὶ αισθησιν καὶ την τέχνην (the last word referring to the familiar definition of τέχνη as σύστημα έκ καταλήψεων έγγεγυμνασμένων)—not that the scholiasts did not sometimes collect different lexical meanings of a single word with or without relevance to the context or reference to their authorities, but the present case is of so singular a nature that it merits further examination.

 $Ka\tau \dot{a}\lambda \eta \psi s$ , to which the note properly belongs, is coupled in the text with κροῦσις, which is one of the most familiar words in the terminology of the playing of stringed instruments. There is every probability that the words were, in combination, suggestive of the musician's vocabulary, and I suspect that the scholium originated not merely in the recording of a specialized (but irrelevant) meaning of κατάληψις gleaned from another source, but as an interpretation of the metaphorical application of the whole phrase καὶ κροῦσιν καὶ κατάληψιν. That this is so is suggested by the introductory words in Suidas' version, μουσικώς δὲ  $\tau \alpha \hat{v} \tau \alpha \epsilon \hat{i} \pi \epsilon$ , and by the form of the note itself  $\pi \lambda \dot{\eta} \xi \alpha \nu \tau \epsilon s$ ... καταλάβωσι.

The same combination of words recurs in Eq. 1379–80—κρουστικός | καταληπτικός τ' ἄριστα τοῦ θορυβητικοῦ—referring in caricature of current 'highbrow' vocabulary to the politician Phaeax. This is clearly not mere coincidence, and suggests that the terms have a peculiarly close connexion with each other, It will also be observed that a musical metaphor here is most appropriate—the

- <sup>1</sup> There is a v.l. percutiunt, but with less good manuscript authority.
- <sup>2</sup> Colson also records a different interpretation by Canon Galpin (q.v.), but praebent is no more satisfactory a word for the action
- <sup>3</sup> The second hand of codex Bg gives prement, an attempted correction with no probable authority, although premere would give a possible meaning. A number of older texts of Quintilian and lexica quote the passage with probant which is also presumably an early emendation as no manuscript is cited. This would mean 'check the

tuning of the string', a plausible enough phrase: cf. h. Merc. 53, etc. (χορδάς) πλήκτρω έπειρήτιζε κατά μέρος; Hom. Od. 21. 410 πειρήσατο νευρής (where the bow is likened to kithara); Ovid, Met. 5. 339 (cf. ib. 10. 145) praetentat pollice chordas (which verb indeed might also have given rise to praebent through praetent with haplography); Statius, Ach. 1. 187 leviterque expertas pollice chordas. But why should the citharoedus be testing the string at the same time as he sings? To give the correct pitch to the voice? But trahunt, continent, X suggests a more uniform series of operations.

skilled orator plays upon his audience, alternately rousing and quelling them by the power of his rhetoric: καταληπτικὸς τοῦ θορυβητικοῦ = capable of putting a damper on the noisy rabble (or of 'disconcerting' them, to use an allied English metaphor). I have no doubt that the scholiast's explanation of the phrase (προκαταλαμβανόμενος τοὺς ἀκούοντας ὥστε θόρυβον μὴ κινῆσαι) is basically correct, and that van Leeuwen's 'seizing on what will cause θόρυβος' (qui corripit quod plausum captet) is improbable. The ribald riposte in the following line, οὔκουν καταδακτυλικὸς σὺ τοῦ λαλητικοῦ, sensu obscoeno, obviously mimics Demus' last words, and so would presumably have to mean καταδακτυλικός of what will cause loquacity.<sup>1</sup>

Even if we omit the suggestion of a musical metaphor it may be observed that καταλαμβάνειν, in extension of its meanings 'overtake, seize, grasp, etc.', shares with the similar verb κατέχειν the meanings 'suppress, quell, blot out'. When one stops the ears (Plut. Mor. 1095 e) or the eyes (Plat. Theaet. 165 b) with the hand, one does not grasp the organ but obstruct by application of pressure.² Κατέχειν is used by Aristophanes very much like καταληπτικόs here in a rhetorical context in Eccl. 434 δ δὲ κατείχε τῆ βοῆ (sc. αὐτούs)—'he reduced them to silence by his outcry', and this I take to be the sense of κατέχειν also in the controversial phrase of the Hippocleides story in Hdt. 6. 129 κατέχων πολλὸν τοὺs ἄλλουs—in the display of after-dinner speaking he quite 'eclipsed' the rest of the competitors. Finally, as we observed that ἐπι- and κατα-λαμβάνω were interchangeable of stopping the sound of a vibrating string or metal, it is interesting that Plutarch (Mor. 713 f) uses ἐπιλαμβάνεσθαι of suppressing a noisy debate.³

While I have suggested that the musical word-play was both intended by Aristophanes and sensible to an audience composed of men who themselves in their youth had gone  $\epsilon i \tau i \kappa \tau \omega s$   $\epsilon i s$   $\kappa \iota \theta a \rho \iota \sigma \tau i \sigma$  and were familiar with the jargon of such sophist-musicians as Konnos (who was the subject of the play of Ameipsias which beat the *Clouds* for second place in 423 B.C.), I do not deny that the words in the context of the *Clouds* refer to the verbal dexterity of the modern sophists. Kroviau doubtless means the striking power of their words or arguments (as Lucian referred to Demosthenes'  $\kappa \rho o \iota \sigma \tau \iota \kappa i \sigma s$ );  $\kappa \sigma \tau i \sigma i \sigma s$  mean their quickness of comprehension, their 'grasp' of a subject, but should we not insist on consistency of usage here and in Eq. 1380 in view of the identity of phraseology? And 'quick to comprehend the noisy' has no meaning. Moreover, the other three nouns of line 318 refer not subjectively to the sophists' mental abilities but externally to their coercive effect on their opponents, their power of confounding, out-talking, striking home—qualities so well exemplified

<sup>I</sup> If the preceding words were immediately comprehensible (as I believe) as punning on musical terminology, κατα-δακτυλικός may even extend, indelicately, this train of thought in characteristic Aristophanic fashion. Cf. Pollux 4. 66 τὸ μέντοι τῶν ψιλῶν κιθαριστῶν ὄργανον ὁ καὶ Πυθικὸν ὁνομάζεται δακτυλικόν τινες κεκλήκασιν; Schol. Ar. Νυb. 651 κατὰ δάκτυλον ἔστι δὲ ρυθμοῦ καὶ κρούματος είδος τὸ κατὰ δάκτυλον ῷ χρῶνται οἱ αὐληταὶ πρὸ τοῦ νόμον. The Knights also contains the elaborate pun on Δωριστί-Δωροδοκιστί (985 ff.). Cf. also 532–3.

<sup>2</sup> Cf. also Plut. Mor. 932 a, e (of the

shadow of the moon obstructing vision).

- <sup>3</sup> For κατέχω of stopping noise cf. Plut. Mor. 414 c; id. Pompey 22. Cf. καταλαμβάνω of suppressing quarrels in Hdt. 3. 128; 7. 9.
- <sup>4</sup> Professor Dover (whose opinion I sought before writing this article) writes: 'The context is verbal and dialectical rather than musical.'
  - <sup>5</sup> Dem. Enc. 32.
- <sup>6</sup> But in fact neither καταλαμβάνω nor its cognates are so used elsewhere in fifthcentury literature, and rarely even in Plato.
- $^{7}$  περι- here is intensive. Cf. Radermacher on Ar. Ran. 839.

later in the comedy in the rhetorical battle of the  $\lambda \acute{o}\gamma o\iota$ . The notion of suppressing or quelling, derived from the musical meaning of  $\kappa a\tau \acute{a}\lambda \eta \psi \iota s$ , is much more appropriate to the context and agrees with the use of  $\kappa a\tau a\lambda \eta \pi \tau \iota \kappa \acute{o}s$  in the Knights. Starkie's translation 'spell-binding' is perhaps not far off the mark.

If this interpretation of the scholium and the line itself is justified, we have a valuable piece of evidence about the playing of the lyre and kithara in the classical period, and a technical term of the practising musician which has been unduly neglected. If it is thought surprising that there is so little additional evidence for the word in the musical writers, it should be remembered that most of the extant works on music are handbooks confined almost exclusively to history and theory, in which remarkably little about actual performance of music is recorded. But when Konnos taught Socrates and his less distinguished pupils to damp the lyre strings as they played, he must have had a word for it, and that word I believe was  $\kappa a \tau \dot{a} \lambda \eta \psi s$ .

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The Singing of Homer and the Modes of Early Greek Music Author(s): M. L. West

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# THE SINGING OF HOMER AND THE MODES OF EARLY GREEK MUSIC

I. THE SINGING OF HOMER (1)

In their invocations of the Muses the early epic poets use indifferently verbs meaning 'tell', 'speak of' (ἔννεπε, ἔσπετε, εἰπέ, εἴπατε) and the verb which we normally translate as 'sing' (ἄειδε, ἀείδεο, ἀείσατε).¹ When they refer directly to their own performance they may use the non-committal  $\mu\nu\eta$ σομαι, or ἐρέω, ἐνισπεῖν, but more often it is ἀείδω, ἄρχομ' ἀείδειν, or something of the sort; and they will pray for good ἀοιδή, or hope for reward from it.² We cannot make a distinction between two styles of performance, one characterized as ἀείδειν, the other as ἐνέπειν: the Iliad begins  $\mu\eta$ νιν ἄειδε θεά, but later has ἔσπετε νῦν μοι Μοῦσαι; Hesiod moves straight from χαίρετε τέκνα Διός, δότε δ' ἱμερόεσσαν ἀοιδήν to εἴπατε δ' ώς . . . ταῦτά μοι ἔσπετε Μοῦσαι . . . καὶ εἴπατε (Th. 104–15); the author of the Hymn to Pan begins ἔννεπε Μοῦσα and ends ἵλαμαι δέ σ' ἀοιδ $\eta$  . . . καὶ σεῖο καὶ ἄλλης  $\mu\nu\eta$ σομ' ἀοιδη̂ς.

The performers described in Homer who entertain audiences or themselves with accounts of famous deeds are called doloi, and their performances deloei. They accompany themselves on the doloii or  $ki\theta a\rho is$ . They are often likened to the Anglo-Saxon scop who sang heroic lays in the banqueting hall to the accompaniment of his hearpe, to the Yugoslav guslar, and to other 'Singers of Tales'. There is little doubt that they are a reflection (perhaps a little idealized as regards the honour in which they are held) of the Homeric poets themselves.

But what does  $\partial \epsilon i \delta \epsilon w$ , in its application to the performance of epic, actually mean? Is it 'sing' in the true sense, as one sings a song? Is it just a conventional word for 'recite' or 'express in verse', like cano in arma uirumque cano? Or is it something in between, some sort of chanting or intoning which differed from ordinary speech delivery but which we would not include within our definition of singing? The indications appear somewhat contradictory. The word  $\partial \epsilon i \delta \epsilon w$  certainly puts the performance of epic in the same category as the singing of songs, however loose that category may be. Accompaniment on an instrument also implies sung rather than spoken delivery; recitation to music,  $\pi \alpha \rho \alpha \kappa \alpha \tau \alpha \lambda \delta \gamma \dot{\eta}$ , was regarded as an invention of Archilochus. In Athenaeus (632d) we find the theory that the notorious metrical imperfections in Homer ( $\sigma \tau i \chi \delta \iota \dot{\alpha} \kappa \dot{\epsilon} \phi \alpha \lambda \delta \iota$  etc.) are accounted for by the fact that he, unlike the elegists, set all his poetry to music. Other considerations, however, would favour something closer to recitation than to singing:

(i) Classical writers distinguish rhapsodes from citharodes. The latter sang the poetry of Homer and others to melodies of their own, accompanying themselves on the cithara, and they looked back to Terpander as the famous exponent of this art.<sup>6</sup> Homer was thought of as a

έαυτοῦ καὶ τοῖς 'Ομήρου μέλη περιτιθέντα ἄδειν ἐν τοῖς ἀγῶσιν ἀποφήναι δὲ τοῦτον λέγει ὀνόματα πρῶτον τοῖς κιθαρωδικοῖς νόμοις. Cf. 1133c τὰ γὰρ πρὸς τοὺς θεοὺς ὡς βούλονται ἀφοσιωσάμενοι (citharodes before Phrynis) ἐξέβαινον εὐθὺς ἐπί τε τὴν 'Ομήρου καὶ τῶν ἄλλων ποίησιν. δῆλον δὲ τοῦτ' ἐστὶ διὰ τῶν Τερπάνδρου προοιμίων. (Citharodes' prooimia were evidently ascribed en masse to Terpander, as rhapsodes' prooimia to Homer. Cf. below n. 24.) Heraclides treated Homer's Demodocus and Phemius as citharodes, 1132b. Timomachus FGrH 754 F I gives the honour of being the first citharode to perform Homer's battles to one Stesandros of Samos (or Cyprian Salamis?).

<sup>&</sup>lt;sup>1</sup> We also find κλείετε (Hes. Th. 105), ὕμνει (h. Herm. 1, h. ix 1, xiv 1, cf. xxxi 1).

<sup>&</sup>lt;sup>2</sup> Hes. Th. 104, h. Dem. 494, h. vi 20, ix 7, x 5, etc. <sup>3</sup> Od. i 154 f., 328, 339 ff., iii 267, iv 17, viii 43 ff., 250 ff., 471 ff., ix 3, xi 368, xiii 9, 27, xvi 252, xvii 358, xxii 330 ff., xxiii 133, xxiv 439; Il. ix 186–91. <sup>4</sup> Besides the passages cited see Il. ii 599 f. (Tha-

<sup>&</sup>lt;sup>4</sup> Besides the passages cited see *Il.* ii 599 f. (Thamyris), xiii 731, xxi 406; h. Herm. 425 ff. (where the instrument is a  $\lambda \dot{\nu} \rho \eta$ ). For Hesiod see my note on *Th.* 

<sup>5</sup> Ps.-Plut. de mus. 1140f/1a; but this only means that it was not used for Homer in the later classical period.
6 Heraclides Ponticus fr. 157 W. ap. Ps.-Plut. 1132c,

O Heraclides Ponticus fr. 157 W. ap. Ps.-Plut. 1132c, καὶ γὰρ τὸν Τέρπανδρον ἔφη κιθαρωδικῶν ποιητὴν ὅντα νόμων κατὰ νόμον ἔκαστον τοις ἔπεσι τοις

rhapsode, <sup>7</sup> and a rhapsode was evidently less of a musician than a citharode.  $\alpha\delta\epsilon_{i\nu}$  can be used of him, but more often it is  $\lambda \acute{\epsilon} \gamma \epsilon \iota \nu$ . He does not normally seem to play an instrument; some explained  $\dot{\rho}\alpha\psi\omega\delta\sigma$ , as =  $\dot{\rho}\alpha\beta\delta\omega\delta\sigma$ , because he held a  $\dot{\rho}\alpha\beta\delta\sigma$ . <sup>10</sup> He was noted for histrionic rather than musicianly qualities. 11 Such was the rhapsode of the classical period, and it was considered that he descended directly from the poet-rhapsode such as Homer.

(ii) The Alexandrian scholars and the grammatical tradition that derived from them attached importance to the study of Homeric accentuation, and record a number of particular accentuations that cannot have been established either from the living Greek language or from theory and analogy, but must have been preserved by a continuous tradition of oral performance from early times: such accentuations as ἀλεωρή, γάρ αὐτον, δηιοτής, θαμειαί, ταρφειαί, καυστειρής, ἀγυιαί, Τρωιούς, ὅθί σφισι, and others. 12 That rhapsodes continued to perform Homer in Hellenistic times, and indeed much later, is known from agonistic inscriptions. 13 It is not the case that Alexandrian scholars kept their noses in books and ignored performing artists of their times. The scholia to Euripides' Orestes contain several comments on the practice of later actors. The ancient commentator responsible (perhaps Callistratus) had seen the play on the stage—as most theatre-goers had—and did not regard the spectacle as irrelevant to his work, though he was clear that the actors were no reliable guides to Euripides' intentions and sometimes perverted them. Homeric scholars were naturally familar with the sound of rhapsodes' voices. These rhapsodes performed Homer in such a way that the word accents were audible, and they were taken to have at least some authority in the matter. Rightly so, seeing that their accentuation had peculiar features which appear genuinely ancient. How ancient? As ancient as the times when the words concerned were in use in the living language. That implies a delivery in something not too far removed from speech tones at least as early as Homer, if not earlier.

There are two ways open to us to reconcile the conflicting indications. We may postulate a dual tradition from the time of Homer, sung delivery to the accompaniment of the phorminx on the one hand, recitation in speech tones on the other. Homer's own allusions to heroic ἀοιδή would all refer to the first, while the classical rhapsodic tradition would be a continuation of the second. Alternatively, the eighth-century doido's with his phorminx and the classical rhapsode without it stand in a single line of tradition, the manner of delivery throughout being a kind of recitative that preserved the natural word accents but was (at least so long as the phorminx remained in use) pitched on definite notes.

In favour of the dual-tradition hypothesis it might be urged that a distinction between performers with and without an instrument can be traced back in art to the early fifth century (sc. citharodes and rhapsodes), and in literary tradition to Hesiod, who received only a bay staff from the Muses (Th. 30). But the ancient inference from Hesiod's staff was not that he did not sing, but

<sup>7</sup> Pl. Leg. 658b εἰκός που τὸν μέν τινα ἐπιδεικνύναι καθάπερ "Ομηρος ραψωδίαν, ἄλλον δὲ κιθαρωδίαν, κτλ.; Rep. 600d "Ομηρον δ' αρα οι ἐπ' ἐκείνου . . . η Ἡσίοδον ραψωδεῖν αν περιιόντας εἴων; Cert. Hom. et Hes. 5 ποιήσαντα γάρ τὸν Μαργίτην "Ομηρον περιέρχεσθαι κατὰ πόλιν ραψωδοῦντα; 17 ἐκείθεν δε παραγενόμενος είς Κόρινθον ερραψώδει τὰ

μέλπομεν εν νεαροίς υμνοις ράψαντες ἀοιδήν; Pind. N. ii ι 'Ομηρίδαι ραπτῶν ἐπέων . . . ἀοιδοί.

9 Pl. Ion 535b, c bis, e, 537a; Ps.-Hdt. 9, 11, 14, 16, 17, 22, 30, 31, 35, Cert. 7-8, 12; 15  $\delta$   $\delta \epsilon$   $O\mu\eta\rho\sigma$  . . . περιερχόμενος έλεγε τὰ ποιήματα, 17, 18.

10 Schol. Pind. N. ii 1d, Eust. in Hom. p. 6. 17, schol.

Pl. Ion. 530a = Suda s.v. ραψωδοί. Cf. below, p. 124. Note, however, that Plato classes Homer's Phemius as a rhapsode (Ion 533c, even if ραψωδοῦ be removed from

<sup>11</sup> Pl. Ion 532d, 535b–6a, Rep. 395a, Alcid. Soph. 14, Arist. Rhet. 1403b22, Poet. 1462a6.

<sup>12</sup> See J. Wackernagel, Kl. Schr. 880-1, 1102-7,

1154–78. <sup>13</sup> E.g. SIG<sup>3</sup> 711 L 31, 958. 35, 959. 9; IG vii 1773.17, 1776.15.

<sup>8</sup> Pl. Ion 535b η τὸν 'Οδυσσέα ὅταν ἐπὶ τὸν οὐδὸν ἐφαλλόμενον ἄδης; [Pl.] Ετγχ. 403d τῶν ῥαψωδῶν οῖ τὰ Ὁμήρου ἔπη ἄδουσιν; Vit. Hom. Scorial. Ι περιιών δὲ τὰς πόλεις ἦδε τὰ ποιήματα; Ps.-Hdt. Vit. Hom. 32 ό δὲ "Ομηρος ἀείδει αὐτοῖς τὰ ἔπεα τάδε, ἃ καλέεται Kάμινος; 33. The word ραψωδός itself implies ἄδειν. It is not attested before the fifth century (GDI 5786 [Dodona], Hdt. v 67, S. OT 391), but best interpreted as referring to formulaic composition. Cf. 'Hes.' fr. 357. 2

that  $\epsilon \pi i \hat{\rho} \hat{\alpha} \beta \delta o v \delta \hat{\alpha} \phi v \eta s \hat{\eta} \delta \epsilon$ . The implication is that the lyre was a valuable adjunct, but its use or non-use did not determine the nature of the vocal performance. This is in line with what we find in several other oral epic traditions. The Serbian bard normally played the gusle, but occasionally did without it, holding a staff or a tobacco-pipe instead and singing in the usual manner. 15 In central and western Yugoslav Macedonia and in northern Russia, epics are sung without accompaniment, and there is evidence that in former times an instrument was used: its disappearance has not put an end to singing.<sup>16</sup>

In fact the dual-tradition hypothesis is supported by no ancient testimony, and it lacks intrinsic plausibility. We have seen that no differentiation between singing and reciting can be extracted from the use of  $\partial \epsilon i \partial \epsilon i \nu$  and  $\dot{\epsilon} \nu \dot{\epsilon} \pi \epsilon i \nu$  in the language of hexameter poetry. On the contrary, the interchangeability of the words, which is paralleled by the indiscriminate use of  $\mathring{a}\delta\epsilon\iota\nu$  and  $\lambda\dot{\epsilon}\gamma\epsilon\iota\nu$  for the later rhapsode's delivery, favours the single-tradition alternative.

I conclude that Homeric 'singing' was truly singing, in that it was based on definite notes and intervals, but that it was at the same time a stylized form of speech, the rise and fall of the voice being governed by the melodic accent of the words. It is the rule in later Greek music that it shows a general correspondence with the word accents, except in the case of strophic poetry, where the pattern of accents is always different from one strophe to the next.<sup>17</sup> The turning away from strophic to astrophic composition in the late fifth century was no doubt due to the desire to exploit to the full the power of music to enhance the sense of the words. Correspondence of melody and accent was part of this; but it need not have been a new idea. No one singing Greek ignored or negated the natural quantities of the words. Why should he ignore or negate their natural accents, when not under the constraint of strophic responsion?

As a feature of the language, of course, the melodic accent was an inheritance from Indo-European times. It is possible that the practice of 'singing' texts by disposing the syllables over a limited set of fixed notes according to their accents was also Indo-European. This is the traditional method of singing the hymns of the Rgveda, in use to this day. The origins of the Rgveda are agreed to lie centuries before Homer, and its text has been preserved almost unchanged from a time that cannot be significantly later than Homer, by written tradition on the one hand, by scrupulous oral instruction on the other. The ancient pitch accents, which disappeared from Sanskrit perhaps two thousand years ago, are marked in the texts and realized in performance, each syllable being sung on one of three notes within the compass of a major or minor third. 'The melodic line follows the text in every detail; the words prescribe the rhythm and the flow; there is one note to each syllable, pitch is independent of duration. One might say that the melody only supports the words.'18

## II. THE MODES (1)

It is time to turn our attention to the phorminx and its capabilities. It was a member of the lyre family. According to literary tradition, Terpander increased the number of strings on the lyre from four to seven. 19 Everyone put Homer before Terpander, so the inference is that the Homeric phorminx was believed to have had four strings. Such evidence is of slight value by

<sup>14</sup> Paus. ix 30. 3; cf. x 7. 3, λέγεται δὲ καὶ Ἡσίοδον ἀπελαθηναι τοῦ ἀγωνίσματος (the hymn competition at Delphi) ἄτε οὐ κιθαρίζειν ὁμοῦ τῆ ἀδη δεδιδαγμένον. See further my note on Hes. Th. 30.

<sup>15</sup> M. Murko, Neue Jb. f. das Kl. Alt. xliii (1919) 285. 16 H. M. and N. K. Chadwick, The Growth of Literature (Cambridge 1932-40) ii 22, 452; A. B. Lord in A. J. B. Wace, F. H. Stubbings (edd.), Companion to Homer (London 1962) 181.

<sup>&</sup>lt;sup>17</sup> For a full account of the correlation of accent and

melody see R. P. Winnington-Ingram in Symb. Osl. xxxi (1955) 64-73; E. Pöhlmann, Griechische Musikfragmente (Nürnberg 1960) 17-29.

<sup>18</sup> A. Bake in The New Oxford History of Music i 200. Earlier four notes were used; see A. H. Fox Strangways, Sammelband der Internationalen Musikgesellschaft ix (1907–8) 482–3.

19 Strabo xiii 2. 4 p. 618, Clem. Str. vi 144. I,

Cleonid. p. 202 Jan, An. Par. i 56. 10.

itself. Archaeology, however, confirms that the lyre in general use in the late Geometric period was a four-stringed instrument, and that this was superseded in the course of the seventh century by one of seven strings, or less often eight.<sup>20</sup> We need not, of course, accept that this was due to Terpander's personal initiative. He was simply the first famous practitioner on the new instrument, and naturally he was taken as the  $\pi\rho\hat{\omega}\tau$ os  $\epsilon\hat{\nu}\rho\epsilon\tau\hat{\eta}_{S}$ . The authors of the *Iliad* and Odyssey may have known the seven-stringed lyre, if (as I believe) they lived in the seventh century; but the tradition in which they worked was one that came to flower not later than 750, and we are bound to assume that the epic bard's established instrument was the one with four strings only.

Four strings means four notes, since it is very unlikely that extra notes could have been obtained by finger-stopping or otherwise manipulating the strings.<sup>21</sup> The voice was presumably limited to the same four notes: in archaic music, we are led to believe, instrumental accompaniment went in unison with the voice.<sup>22</sup> There is nothing a priori objectionable in this limitation.<sup>23</sup> For a recitative based on word accents, four notes was ample. We have seen that the Rgveda has been done at different times on four notes and on three.

It is uncertain whether the lines ascribed to Terpander (fr. 5 Bergk; Page, PMG p. 363),

σοὶ δ' ἡμεῖς τετράγηρυν ἀποστέρξαντες ἀοιδήν έπτατόνω φόρμιγγι νέους κελαδήσομεν υμνους,

preserve a genuine memory of tetratonic song or are a literary-historical forgery.<sup>24</sup> At least they presuppose that the pre-Terpandrian four-stringed phorminx went with a four-note song. We also hear of a citharodic nome (established, of course, by Terpander) called the τετραοίδιος  $v \delta \mu o s$ , 25 which may or may not have been based on four notes.

To what four notes were the strings of the phorminx tuned? If we could answer that, we would be some way towards reconstructing the vocal melody, as we have the accents of the text to guide us. I do not think it is such an impossible question as it may seem, if we work back from what is known about early Greek modal scales.

Greek theory recognizes three musical genera, the enharmonic, the chromatic, and the diatonic. The first is characterized by the occurrence in the scale of a tetrachord segment, spanning the interval of a fourth, in which the notes are separated by very unequal intervals, of the order  $\frac{1}{4} + \frac{1}{4} + 2$  tones (e \(\bar{e}\) f a). <sup>26</sup> In the chromatic genus the inequality is somewhat reduced, the paradigm being  $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$  tones (e f f#a). In the diatonic it is reduced further, the second and third intervals becoming more or less equal,  $\frac{1}{2} + I + I$  (e f g a). Fractions of a tone cannot, of course, be very accurately measured by the ear or reliably achieved in performance, and the boundary between enharmonic and chromatic in particular was imprecise. Aristoxenus allows

<sup>20</sup> See O. J. Gombosi, Die Tonarten und Stimmungen der antiken Musik (Kopenhagen 1939) 35-40; M. Wegner, Archaeologia Homerica U (Musik und Tanz) (Göttingen 1968) 2-12. Seven- and eight-stringed lyres had earlier been in use among the Minoans and Mycenaeans (Wegner 26-7).

<sup>21</sup> See Winnington-Ingram, CQ vi (1956) 183–6. He is concerned with the classical cithara, but the same

arguments hold for the phorminx.

<sup>22</sup> Ps.-Plut. 1141b, οἴονται δὲ καὶ τὴν κροῦσιν τὴν ύπὸ τὴν ἀδὴν (heterophonic or pararhythmic accompaniment) τοῦτον (the dithyrambist Krexos) πρῶτον εύρεῖν, τοὺς δ' ἀρχαίους πάντας πρόσχορδα κρούειν (played in unison with the voice)

<sup>23</sup> The same is true of a good deal of Anglican chant. A number of the specimens of primitive music given by M. Schneider in The New Oxford History of Music i 61-82 have an equally restricted melodic range; some of them are on only three notes, or two. See nos 1-3, 5, 7-10, 14, 27-8, 56, 58, 61, 86; and p. 152.

<sup>24</sup> They suit the transition at the end of a prooimion, and might genuinely be the work of some early citharode who contributed to the corpus of prooimia later attributed to Terpander. Most but not all of these were in hexameters; see CQ xxi (1971) 307-9. For their non-integral character cf. Cic. de Orat. ii 325, conexum autem ita sit principium consequenti orationi ut non tamquam citharoedi prooemium adfictum aliquid sed cohaerens cum omní corpore membrum esse videátur.

<sup>25</sup> Ps.-Plut. 1132d, Poll. iv 65, Suda iii 477. 16 Adler

(τετράδιος codd.: a genuine variant?).

<sup>26</sup> All note values are to be understood in terms of relative, not absolute pitch. Successive octaves are represented as C-B, c-b, and c'-b' (c' = Middle C). A line over a letter (e) indicates that the note is raised by a quarter tone.

for a range of tunings within each genus, with only an arbitrary line dividing one genus from another. 27

He contended that the diatonic genus was the most natural and (therefore) the most ancient of the three, and apparently thought that the enharmonic, which he considered the most sophisticated and beautiful, was the last to develop.<sup>28</sup> Some modern writers repeat this as if it were a historical fact about the evolution of Greek music and not merely a theoretical standpoint.<sup>29</sup> All the evidence indicates that it was actually the enharmonic type that was characteristic of archaic and classical music down to the latter part of the fifth century, and that the chromatic developed from it. ἐναρμόνιος itself means 'in tune', and the enharmonic genus is quite often referred to simply as ή άρμονία, whereas the χρωματικὸν γένος (οτ χρώμα) is marked by its name as something secondary, 'coloration', a deviation from the standard. The antithesis of the two appears in the anonymous sophist, probably of the early fourth century B.C., a fragment of whose work is preserved in P. Hibeh 13. He is attacking the doctrine (which may be Damon's) that adherence to άρμονία makes men manly, while χρώμα makes them effeminate. He knows the category 'diatonic', but appears to subsume it under χρωμα; he argues that although the music of the Aetolians and Dolopes and all those round Thermopylae is diatonic, they are manlier than the tragic actors, whose songs are enharmonic, and immediately follows this with [ωστε οὔτε] χρώμα δειλούς οὔτε άρμονία ἀν[δρείους ποιεί.] Other sources tell us that the enharmonic genus was typical not only of tragedy, 30 but also of Simonides, Pindar, and the old style generally;<sup>31</sup> it was invented by Olympus himself;<sup>32</sup> pre-Aristoxenian theorists had concerned themselves with it exclusively.<sup>33</sup>

Originally, we are told, the semitone interval e-f was not divided into microtones. The melodies of Olympus and Terpander were  $\delta \pi \lambda \hat{a} \kappa \alpha \hat{i} \tau \rho (\chi o \rho \delta \alpha)^{34}$  In other words the tetrachord e ē f a developed from a trichord e f a, and this simpler structure was to be heard in some archaic music that was still played when pseudo-Plutarch's source (apparently Aristoxenus) wrote. It survived particularly in ritual contexts: Ps.-Plut. 1133e (Olympus the elder) τοὺς νόμους τοὺς άρμονικοὺς ἐξήνεγκεν εἰς τὴν Ἑλλάδα οἶς νῦν χρῶνται οἱ Ἑλληνες ἐν ταῖς ἑορταῖς τῶν θεῶν. The old Spondeion scale<sup>35</sup> belongs in this context. It was apparently formed from the five notes e  $\bar{f}$  a b  $\bar{c}'$ . 36 The  $\frac{3}{4}$ -tone interval e— $\bar{f}$  has a chromatic appearance, and the ceremonial melodies in which the scale was used may have come to be played more chromatically in the fourth century than they were at an earlier period; but if that is the explanation, it underlines the fact that the shift from enharmonic to chromatic was essentially a change in style of performance. The raison d'être of the enharmonic f was not to make a pure major third with the a-an interval not recognized by the Greeks as concordant.<sup>37</sup>

Six other early scales are recorded. Aristides Quintilianus i 9 (pp. 18 f. W.-I.) describes them, saying that they were used by οἱ πάνυ παλαιότατοι, and that they are the scales mentioned by Plato in Rep. 398e-399a. His immediate source must be post-Platonic, as he could not have made the connexion with Plato on his own initiative; ultimately, it is to be presumed, they go back to

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<sup>27</sup> Harm. i 26.
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<sup>Harm. i 19, 23; fr. 83 Wehrli.
E.g. S. Michaelides, The Music of Ancient Greece.</sup> An Encyclopaedia (London 1978), under Diatonon genos and Enharmonion genos; M. Pintacuda, La Musica nella

Tragedia Greca (Cefalù 1978) 59 f., 160, 163.

30 Arist. Probl. xix 15, Plut. de aud. 46b, Ps.-Plut. 1137de, Psellus  $\pi$ .  $\tau \rho a \gamma \omega \delta i a s s$  (ed. R. Browning in  $\Gamma EPA\Sigma$ , Studies Presented to G. Thomson [Prague 1963] 67 ff.). Chromaticism was introduced to tragedy by Agathon (Plut. Quaest. conv. 645de) or Euripides (Psellus). On Psellus' remark that some tragic enharmonic had an admixture of the diatonic, see below, p.

<sup>&</sup>lt;sup>31</sup> Ps.-Plut. 1137f, 1145a.

<sup>&</sup>lt;sup>32</sup> *Ibid.* 1141b, 1143b.

<sup>33</sup> Aristox. Harm. i 23, fr. 83; Ps.-Plut. 1143e.

<sup>&</sup>lt;sup>34</sup> Ps.-Plut. 1135ab, 1137ab.

<sup>35</sup> Ibid. 1134f-5b, 1137b-d, cf. Arist. Probl. xix 32, Nicom. p. 253 Jan.

<sup>36</sup> Winnington-Ingram, CQ xxii (1928) 83 ff. <sup>37</sup> Cf. Fox Strangways (n. 18) 477 f. 'The actual sound of these intervals, as sung in modern European Folksong (by all reports) or in India, does not present itself as either major or minor Third, but as something which is neither and yet perfectly suitable. . . . It seems quite clear that though major Thirds and minor Thirds may incidentally be sung often enough, the intervals are not thought so; and it is the "functions" of notes that really matter.'

one of the earliest writers on music—perhaps Damon, whom Aristides mentions elsewhere as having recorded some irregular ἀρμονίαι.<sup>38</sup> They may be translated as follows:

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Lydian Ā B<sup>b</sup> d e ē f a ā Ionian e ē f a c' d'
Dorian d e ē f a b b c' e' Mixolydian e ē f g a ā b<sup>b</sup> e'
Phrygian d e ē f a b b c' d' Syntonolydian e ē f a c'
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There is no doubt that they are genuinely ancient, not some later reconstruction or fraud.<sup>39</sup> They bring us much closer to actual musical practice in the classical period than the tidy, regular scales set out by the later handbooks. The scale of the *Orestes* fragment is in fact identical with Aristides' Phrygian, except that the additional note c appears in the instrumental part. The use of defective or 'gapped' scales is very widespread among the peoples of the world. Some of the Greek ones are comparable with scales used in the music of the Far East. For example the Spondeion e  $\bar{f}$  a b  $\bar{c}'$  is scarcely different from the Chinese scale e f# a b c#', while the Japanese *kumoizyoosi* mode on e f a b c' e' only needs one additional note at the lower end to become the Dorian scale with undivided semitones, d e f a b c' e'. The trichord of the form e f a, semitone + major third, is employed over a large area in the Far East, and in China and Java there seems to have been a development from it in the direction of e f# a, paralleling the development of the chromatic genus in Greece.<sup>40</sup>

Of course, we cannot take Aristides' account as a comprehensive record of classical scales, but we can take it as a record of the form that six of the main ones (including the basic triad Dorian, Phrygian, Lydian) had at a particular epoch. This epoch may be located in the latter part of the fifth century, say c. 420, on the following grounds.

- (i) The enharmonic style is still dominant, but the divided semitone is well established.
- (ii) The Hypodorian and Hypophrygian modes, which were a novelty in the late fifth century, do not appear.<sup>41</sup>
- (iii) Several of the scales have too many notes to be played on a seven-stringed instrument. If we eliminate the division of the semitones e-f and b-c', the Dorian, Phrygian and Lydian scales are all reduced to exactly seven notes, but as it stands they seem to date from a time when nine-stringed citharas were in use.<sup>42</sup> The nine-stringed cithara is attributed by Plutarch to Phrynis,<sup>43</sup> and it appears in vase-painting after c. 450.<sup>44</sup>

When the early scales—Aristides' six, the Spondeion, and the Phrygian of the Euripides fragment—are analysed and compared, it is found that they are all constructed according to a common formula. Each contains the enharmonic tetrachord (or trichord)  $e(\bar{e})$  f a, and from one to five other notes which make consonances of a fourth or fifth with notes of the tetrachord. There is only a single note in the whole set which is not accounted for by this formula: the diatonic g in the Mixolydian scale. We must conclude that the tetrachord, whether it came high or low in the scale, had primary status in the melody, it was a nucleus, while the notes outside the tetrachord derived their significance from their relation to it.

This conclusion tallies with the fact that in the Perfect Systems, the comprehensive scales in which theorists sought to incorporate all individual scales and give each note a fixed identity, the tetrachord appears as the segment Hypate-Parhypate-Lichanos-Mese. Mese, we know, was of special importance. It was called the  $\dot{\eta}\gamma\epsilon\mu\dot{\omega}\nu$ , other strings were tuned from it, and if it was out

44 Gombosi (n. 20) 67 ff.

<sup>&</sup>lt;sup>38</sup> ii 14, p. 80. 29 W.-I.; Winnington-Ingram, *Mode in Ancient Greek Music* (Cambridge 1936; repr. Amsterdam 1968) 59. For the immediate source L. Laloy, *RPhil* xxiv (1900) 33, plausibly suggested a commentary on Plato. Thrasyllus may be a possibility.

<sup>&</sup>lt;sup>39</sup> See J. B. Mountford, CQ xvii (1923) 126–9; Winnington-Ingram (n. 38) 21 ff. (with reservations about the Lydian scale).

<sup>&</sup>lt;sup>40</sup> See L. Picken in *The New Oxford History of Music* i 145 f., 166 f.

<sup>&</sup>lt;sup>41</sup> Agathon is said to have introduced them to tragedy (Psellus,  $\pi$ .  $\tau \rho \alpha \gamma$ . 5). Of course if the source is a commentary on Plato, they do not appear because Plato does not mention them in the passage concerned.

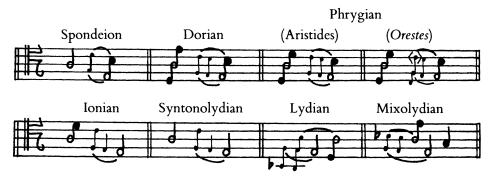
<sup>42</sup> Unless we say they are just aulos-scales; but harmonic theory was always based on the cithara.

<sup>43</sup> Agis 10. 7, de profic. in virt. 84a, Lac. Apophth. 220c. Others say Timotheus (Plin. NH vii 204) or Prophrastus of Pieria (Nicom. p. 274 J., Boeth. Inst. Mus. i 20).

of tune the whole melody sounded wrong, not just the one note; good melodies kept returning to it.<sup>45</sup> From the Orestes fragment and other musical texts we see that Hypate, a fourth below, often served as a cadence. We may assume that the notes of the tetrachord had similar functions in all the old scales; and we may be allowed for the moment to call the outer ones Mese and Hypate, even though the terms do not here refer either to a particular accordatura or to a particular Perfect System.

The inner notes of the tetrachord did not make consonances with the outer ones. Their position close above Hypate, and the variability of their exact pitch as between enharmonic and chromatic and within each genus, suggests that they served as leading-notes, decorating or preparing the way for Hypate. This is borne out by their use in the Orestes fragment, where we see the sequence  $f \bar{e}$  e twice, and also  $e \bar{e}$   $f e \bar{e} \dots f \bar{e}$   $f \dots e \bar{e}$  a. The development of the original trichord e f a into e ē f a is easy to understand: two leading-notes allowed more effective and varied figuration than one. The division of the semitone was probably first made by pipers, voluntarily or involuntarily, by partial uncovering of a finger-hole.<sup>46</sup>

The internal hierarchy of the old scales may be represented on the tenor clef (in which the second line down is middle C) in this way:



Mese and Hypate are shown as minims, their consonances as crotchets on the same stem. The leading-notes are shown as small crotchets (offset from the line in the case of quarter-tone positions), with a legato-mark linking them with their focal note. Their consonances are again shown as if making chords with them.

In some cases notes consonant with the leading-notes to Hypate are well placed to serve themselves as leading-notes to Mese or to the note a fifth above Hypate ('Paramese'); but in the Orestes, Lydian, Ionian, and Syntonolydian scales we find such consonant notes floating on their own. In the case of the last two it is interesting to observe that the leading-note of the original trichord (f) is answered by the consonant note a fifth higher (c'), but the secondary ē is not answered by b', as if the f retained some primacy; c' is accompanied by b' only where b' is also present, so that the function of the b' may be to divide the semitone progression c'-b' rather than to make a consonance with the ē below. The differences of character between the modes no doubt depended on several other factors—rhythm, tempo, expression—but the use of different consonances must have helped to determine them.

Can we now draw any conclusions about the tuning of the Homeric phorminx? Sceptics will deny the possibility. Why should there be any continuity between the sort of melody played on the Geometric phorminx and those played on the classical cithara? Why should a 'Dorian' scale, let alone a 'Phrygian' or a 'Lydian' one, have any relevance to the minstrelsy of Ionian bards two or three centuries before the earliest evidence for the structure of those scales?

means 'a letting through', sc. of an extra quantum of air; the unit of measurement based on the lyre is τόνος, 'a tightening', sc. the tightening required to increase a fourth to a fifth.

<sup>45</sup> Arist. *Probl.* xix 20, 33, Ps.-Plut. 1135a, Dio

Chrys. li 7 (ii 174. 3 Arnim).

46 According to Ps.-Plut. 1135b (apparently from Aristoxenus) it originated in the Lydian and Phrygian modes. The name given to the smallest interval,  $\delta i \epsilon \sigma i s$ ,

Certainly the spread of the seven-stringed lyre in the seventh century betokens a revolution in music. That is just the time when the distinction between 'Dorian', 'Lydian', and 'Phrygian' styles is likely to have been established. The earliest evidence for the nomenclature comes from Alcman at the end of the seventh century and Stesichorus in the sixth, both of whom mention a 'Phrygian melody'.47 Whether or not the 'Lydian' and 'Phrygian' styles were genuine importations from barbarian music, 48 they must have become established under these names at a period when the Phrygian and Lydian civilizations flourished, were in lively contact with the Greeks, and were viewed by them without contempt. We might go as early as the eighth century for Phrygia or as late as Croesus for Lydia, but taking the two together the seventh century is the likeliest time. Now, we have seen that with the elimination of divided semitones, the Dorian, Lydian and Phrygian scales of Aristides all emerge as heptatonic and suitable for playing on the seven-stringed lyre.<sup>49</sup> It is unlikely that they changed significantly between the seventh century and the fifth, except for the division of semitones: any more fundamental alteration would have destroyed their identity. They were after all identifiable in such seventh-century music as continued to be heard in the classical period, in Alcman's Partheneia (Dorian, Ps.-Plut. 1136f), Terpander (PMG 698), and the nomes attributed to Olympus.

The gap in time, then, between the Homeric  $\phi o \rho \mu \iota \kappa \tau \dot{\eta} s$  and the source of Aristides is largely bridgeable. What about the gap in technique? The introduction of the cithara made it possible to execute more varied melodies on strings, perhaps to imitate the facility of the pipes and the figurations of barbarian song. But it is not likely to have signified a fundamental departure from traditional melodic structure, from the accustomed relationships between 'key-note' and cadence, for example. We are justified in looking for a tetratonic phorminx scale behind the heptatonic cithara scales, the more so as one feature of the nomenclature of the strings may provide an indication of continuity. The strings of the seven-stringed cithara and lyre were apparently called

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ύπάτη 'top' (i.e. at the top of the instrument as held; its note was the lowest)
παρυπάτη 'next to top'
λιχανός 'forefinger'
μέση 'middle' (string; or 'middle-finger string'?)
τρίτη 'third' (string; or 'third-finger string'?)
παρανήτη 'next to bottom'
νήτη 'bottom'.
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The terms  $\dot{v}\pi\dot{\alpha}\tau\eta$  and  $\dot{v}\dot{\eta}\tau\eta$  must be quite old, because the superlatives  $\ddot{v}\pi\alpha\tau\sigma s$  and  $\dot{v}\dot{\epsilon}\alpha\tau\sigma s$  disappeared from ordinary speech at an early date. They may well have been applied to strings of the phorminx.  $\mu\dot{\epsilon}\sigma\eta$  may have been also, but if so it must have been in the sense 'middle-finger string', since there is no string that is the middle of four. The most interesting name is  $\lambda\iota\chi\alpha\nu\dot{\delta}s$ , which links a string with a particular finger. On the seven-stringed lyre such a definite connexion hardly makes sense: the fingers had to move from string to string, at least some fingers, and the forefinger was surely one of the most mobile. It is easiest to account for the name on the supposition that it was originally the name of the second string (from the top) of the four-stringed phorminx. Its transfer to the cithara would presuppose some continuity of melodic function.

instrument.

<sup>47</sup> Alcm. 126 Φρύγιον αὔλησε μέλος τὸ Κερβήσιον, Stes. 212 τοιάδε χρὴ Χαρίτων δαμώματα καλλικόμων ὑμνεῦν Φρύγιον μέλος ἐξευρόντας άβρῶς ἦρος ἐπερχομένου.

<sup>48</sup> See below, p. 126.

<sup>&</sup>lt;sup>49</sup> The Phrygian mode, admittedly, is more strongly associated with the pipes (cf. Alcm. loc. cit., Arist. Pol. 1342b); it was supposedly invented by the piper Hyagnis or Marsyas. But no mode is peculiar to one

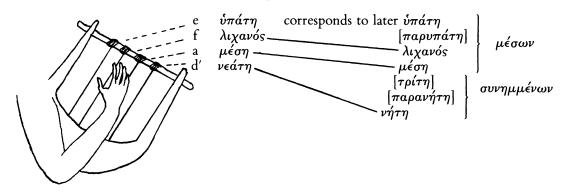
<sup>50</sup> They are practically confined to poetry. νέατος survives in Hippocratic writing and in the Arcadian dialect. The choice of στρατηγός υπατος as the Greek for consul is unexplained; see H. J. Mason, Greek Terms for Roman Institutions (Toronto 1974) 165 ff.

<sup>&</sup>lt;sup>51</sup> Artistic representations, for what they are worth, sometimes show the forefinger on the third string, sometimes on the second (Gombosi [n. 20] 121 f.).

It is reasonable to assume that the phorminx scale was based on the same fundamental trichord as all the archaic scales, e f a, with a fourth note above or below providing a consonance. Now in the later Systems these three notes are identified as Hypate, Lichanos, Mese. But e was not in fact the lowest note in at least two of the three most important ἀρμονίαι (Dorian, Phrygian; nor in Lydian, unless Aristides' Syntonolydian is taken as the main form). The nomenclature must have been fixed at a stage before the common use of the tone below e, at first called Hyperhypate.<sup>52</sup> It is tempting to assume that it goes back to a phorminx-tuning, and that the strings called Hypate, Lichanos, and (?) Mese on that instrument were tuned to the trichord. Nete then gave a higher note, for which there would be five possibilities: the fifths above the notes of the trichord (b, c', e'), and the fourths above Lichanos and Mese (b<sup>b</sup>, d').

If one accepts the argument that a number of modal scales were preserved from the seventh to the fifth century with little change—this does not, of course, preclude the decline of some and the emergence of others during that period—it follows that a scale called Ionian is likely to be closer to that of eighth-century Ionian minstrelsy than are scales called Dorian, Lydian, or Phrygian. The Ionian scale of Aristides presents in fact a more archaic appearance than any of the others in the set apart from the Syntonolydian, having only six notes, or five if the division of the semitone be discounted: e f a c' d'. It agrees with the scale postulated for the phorminx in having no notes below the trichord. But it leaves us with two above it to choose between. It is the c' (Lichanos + 5) that is the more likely to be a secondary feature, being common to most of the scales, whereas the d' is distinctive of Ionian and Phrygian. e f a d' would still be recognizably Ionian, but e f a c' would be Syntonolydian. The d' as Nete, moreover, will correspond to the  $\nu \dot{\eta} \tau \eta$   $\sigma \nu \nu \eta \mu \mu \dot{\epsilon} \nu \dot{\omega} \nu$  of the later nomenclature; c' would not correspond to any sort of  $\nu \dot{\eta} \tau \eta$ . 53

The tuning suggested for the Homeric phorminx is therefore:



III. THE SINGING OF HOMER (2)

With four notes in his scale, the ảoiós had a measure of freedom. The accent might dictate when he went up or down, but he might have the choice of two or three different notes that he could go up or down to. His procedure cannot have been aleatoric. He must have been guided by familiar melodic patterns. We may surmise that he gave prominence to Mese—harped on it, so to speak. If the cadential function of Hypate was already established, there might have been a general pattern, within a melodic period, of progression from a Mese-centred part to a part in which Hypate became the focus.<sup>54</sup> The reconciliation of the accentual melody to this overall

 $<sup>^{52}</sup>$  Thrasyllus *ap.* Theon. Smyrn. p. 88 Hiller; Boeth. *Inst. Mus.* i 20 p. 208 Friedlein. An alternative name is διάπεμπτος (in the δρμασία, p. 32 Pöhlmann).

<sup>53</sup> It may be of interest to note that Gombosi, by quite different arguments, arrives at a tuning for the four-stringed lyre which differs in only one note from that suggested here (op. cit. [n. 20] 41, 77: e a b d').

<sup>&</sup>lt;sup>54</sup> This sort of downward progression is common in primitive melodies. See the examples in Schneider (above n. 23), nos 14, 26, 56, 68, 71, and p. 152 ex. 247, p. 178 exx. 284 and 286. Often these songs end on the note a fourth, fifth, or octave below that on which they began. It may be relevant that the earlier Greek practice was to read scales downwards.

pattern (the Greek for which, I suppose, would be νόμος) would be analogous to the reconciliation in ordinary speech of the individual word accents and the overall sentence accent.55

With his phorminx the bard reinforced the vocal line, and he no doubt made some additional use of the instrument during pauses. He began with something called  $d\nu a\beta o\lambda \dot{\eta}$ :

Od. i 155, viii 266 Od. xvii 261-3

φορμίζων ἀνεβάλλετο καλὸν ἀείδειν. περί δέ σφεας ήλυθ' ίωή φόρμιγγος γλαφυρής άνὰ γάρ σφισι βάλλετ' ἀείδειν

The scholiast on i 155 says  $\phi o \rho \mu i \zeta \omega v$ .  $\tau as \chi o \rho \delta as \dot{\rho} v \theta \mu i \zeta \omega v$ , that is 'tuning up', and attempts to connect φορμίζων with φροίμιον. At viii 266 ἀνεβάλλετο is glossed ἀνεκρούετο, προοιμιάζετο. Cf. Eust. 1404. 34 προανεκρούετο ώς ἀσόμενος, ήτοι προοιμιάζετο. Pindar, addressing the lyre, writes τας ἀκούει μὲν βάσις ἀγλαΐας ἀρχά, πείθονται δ' ἀοιδοὶ σάμασιν, άγησιχόρων ὁπόταν προοιμίων ἀμβολὰς τεύχης ἐλελιζομένα: that is, the preliminary notes of the lyre serve as a signal and guide to dancers and singers. 56 Elaborate ἀναβολαί seem to have been a feature of the dithyrambs of poets such as Cinesias.<sup>57</sup> Later writers use ἀναβάλλεσθαι rather loosely of beginning a song, etc., with or without accompaniment.<sup>58</sup> The Homeric  $\partial a \beta \partial n \dot{n}$  does seem to have been something more, involving some prefatory notes or strumming on the phorminx before the singing began, but it was probably nothing extended. Perhaps Ovid gives us the right picture in two passages about divine singers in the Metamorphoses:

Met. v 339-40

Met. x 145-7

querulás praetemptat pollice chordás, atque haec percussis subiungit carmina neruis. ut satis impulsás temptávit pollice chordás et sénsit variós quamvís díversa sonárent concordáre modós, hóc vócem carmine móvit.

The singer broke off at intervals and made a fresh start if the audience was still interested:

Od. viii 87 ff.

ήτοι ὅτε λήξειεν ἀείδων θείος ἀοιδός αὐτὰρ ὅτ' ἄψ ἄρχοιτο καὶ ὀτρύνειαν ἀείδειν Φαιήκων οἱ ἄριστοι, ἐπεὶ τέρποντ' ἐπέεσσιν . . .

He probably made short pauses between sections of his narrative, perhaps after every line, and filled the hiatus with instrumental flourishes. That the classical citharode used strums to punctuate his performance is suggested by Ar. Ran. 1281 ff., where choruses of Aeschylus are made into citharodic nomes by adding  $\tau o \phi \lambda a \tau \tau o \theta \rho a \tau \tau o \theta \rho a \tau$  after each period, and perhaps Plut. 290, alluding to Philoxenus' Cyclops dithyramb (PMG 819), καὶ μὴν ἐγὼ

55 T. Georgiades, Der griechische Rhythmus (Hamburg 1949) 122 ff., propounded a faintly similar theory, according to which the singer repeated the same melody in each line, but with minor modifications (shakes on

particular notes) to take account of word accents.

<sup>56</sup> P. i 3. Schol. glosses ἀμβολάς as προαναφωνήσεις καὶ κρούσεις. Cf. schol. N. vii 114d (ἀναβάλεο)

και κρουσεις. Cf. scnol. N. VII 114d (αναραλεο·) ἀνακρούου καὶ ἄρχου τι λέγειν; Εt. Μαση. ἀμβολάδην· ἀναβάλλων, ἢ ἐξ ὑποβολῆς. ἀμβολαὶ γὰρ αἱ ἀναβολαί, ἀρχὴ καὶ προοίμιον παρὰ τοῖς μουσικοῖς. <sup>57</sup> Phot. ἀναβολή· προοίμιον διθυραμβικοῦ ἄσματος. Εὕπολις Βάπταις (5 Demiańczuk, 67Α Edmonds)· αὐλησον †αὐτὴν κύκλιον ἀναβολήν τινα. Ar. Pax 830 (schol. τὰς ἀρχὰς τῶν ἀσμάτων). Αν. 1385 (schol. προοίμια). Arist. Rhet. 1409b25, αὶ περίοδοι αὶ

μακραὶ οὖσαι λόγος γίνεται καὶ ἀναβολῆ ὅμοιον· ὥστε γίγνεται ὁ ἔσκωψε Δημόκριτος ὁ Χῖος εἰς Μελανιππίδην ποιήσαντα άντὶ τῶν ἀντιστρόφων ἀναβολάς, 'οἱ τ' αὐτῷ κακὰ τεύχει ἀνὴρ ἄλλῳ κακὰ τεύχων, ή δὲ μακρὰ ἀναβολή τῷ ποιήσαντι κακίστη'. The word is here apparently extended to instrumental

passages within a composition.

58 Theoc. vi 20, viii 71, x 22, Philostr. imag. i 29, Aphthon. Progymn. 1 p. 2. 5 Rabe, Himer. or. iii 3, Nonn. D. i 478, xix 102, xxiv 242. A little differently in Philostr. Jun. imag. 6. 3: (Orpheus' right foot) αναβάλλεται τὸν ρυθμὸν ἐπικροτῶν τοὕδαφος τῷ  $\pi\epsilon\delta$ ίλω. In Ar. Pax 1267 and Isoc. Panath. 39 προαναβάλλεσθαι seems to mean 'rehearse'.

βουλήσομαι—θρεττανελό—τὸν Κύκλωπα μιμούμενος κτλ. Apuleius, describing a statue of a youth singing, writes, manús eius tenerae, prócérulae: laeva distantibus digitis nervós mólitur, dextra psallentis gestú pulsábulum citharae admovet, ceu paráta percutere cum vóx in canticó interquiévit (Flor. 15). The extended ἀναβολαί for which Melanippides was criticized may be considered as a development of this technique.

It is interesting to compare the practice of the modern Yugoslav epic singer as it is seen in Béla Bartók's transcription of Salih Ugljanin's 1934 performance of The Captivity of Dulić Ibrahim.<sup>59</sup> Despite the difference of melodic style and the use of a bowed instrument, it shows some similarities with what has been postulated for Homer. Salih begins with nine bars on the gusle, and then starts to sing. He rests his voice at the end of each verse, even when there is no syntactical pause. In some verses the vocal line is based on a single repeated note with ornamental shakes, in others there is a descending pattern. There is almost always a fall on the final syllable, most commonly of a fifth. Little is attempted on the gusle while the verse is being sung; often it simply sustains a single continuous note. But as soon as the verse is complete it launches into a decorative figure, the equivalent of eight or twelve semiquavers. Occasionally the voice holds the last syllable while this is proceeding. After 105 verses there is a longer passage on the gusle alone. The transcription is not continuous after this point, but the notes (pp. 463 ff.) record further instrumental interludes following verses 163 and 508. At line 763 Salih stopped, and showed that he was doing so by delaying the last syllable to the end of the instrumental figure and then singing it on a prolonged note in unison with the gusle. After an interval for conversation he resumed with a new thirteen-bar prelude on the gusle. At the end of the whole song (line 1811) he repeated the technique used at 763; there was no postlude, voice and gusle fell silent together.

We cannot know exactly how Homer was sung, how Homer sang. But the arguments that have been presented, however frail, are rational, and an *exempli gratia* reconstruction based on them may bring us nearer than we have been to an idea of the kind of thing Homeric singing was. Here is such a reconstruction for the opening of the *Iliad*.



<sup>59</sup> M. Parry and A. B. Lord, Serbocroatian Heroic Songs (Camb. Mass. 1953) i 437-62.



The rhythmic value assigned to the dactyl, •• •• •• I, is merely an approximation. 60 Oxytone words, be it noted, did not at this period (or indeed in the classical period) lose their acute within the phrase. 61

In the eighth century the bard always 'sang', and normally accompanied himself on the four-stringed phorminx. The spread of the cithara in the following century caused a schism. Some adopted it, and evolved a more elaborate, heptatonic style of vocal melody to go with it. Others, out of conservatism, or finding the new instrument technically too demanding, persevered in the traditional style. They had the advantage of being able to go on longer without strain, and they therefore retained the loyalty of the public interested in the narrative rather than in musical virtuosity. For musical interest, however, they could not compete with the citharodes, and they soon disencumbered themselves of their obsolescent instruments. The vocal melody, no longer underpinned by a tuned instrument, may in time have lost its definite outlines and become less sharply differentiated from speech-melody. The musical writers take no notice of rhapsodes at all, and no one associates them with singing in any specific mode. But some differentiation from speech-melody may have been maintained. A fragment of evidence for its modification by melodic convention may survive in the Homeric scholia. As a general rule, trochaic paroxytone words followed by an enclitic monosyllable were given a double accent, e.g. ἄνδρά  $\tau \epsilon$ , θάρσός μοι, syllables such as  $\dot{\alpha} \nu |$ , θάρ|, being in effect diphthongs with a fall of tone on the second element  $(\acute{a}\acute{v})$ . <sup>62</sup> But on the opening words of the Odyssey,  $\ddot{a}v\delta\rho a$   $\mu o \iota \ddot{\epsilon}v\nu\epsilon\pi\epsilon$ Μοῦσα, the scholiast notes: ἔδει μὲν ἐν τῷ ἄνδρα δύο εἶναι ὀξείας, ὡς τὸ 'ἄνδρά τε καὶ οἶκον' (νι 181), ἀλλὰ ἐφυλάξατο ὁ ᾿Αρίσταρχος διὰ τὸ μὴ ἐν τῆ εἰσβολῆ τῶν λέξεων κακοφωνίαν  $\pi$ οι $\hat{\eta}$ σαι. In ancient texts, even scholarly ones, accents were normally written only sporadically. It is hard to believe that a commentator with an interest in accentuation would have inferred from the mere absence of an accent on  $\delta \rho a$  in the text before him that Aristarchus had prohibited it: he would simply have applied the rule and said 'ἄνδρα must have two acutes'. He must have had record of an explicit statement by Aristarchus and, if so, it must have been based on rhapsodes' practice. The 'cacophony' explanation may have been formulated by Aristarchus himself; but if the rhapsodes diverged from the usual accentuation here, he was surely right to connect this with its being the opening of the poem. That is one place where we might expect some tension between natural accent and melodic convention—as in two later Greek songs which otherwise show correspondence of melody and accent, the opening word is set on a rising fifth in contradiction of its accent. 63 Without knowing what the rhapsode's convention was, we can appreciate that three ups and downs in the five opening syllables, άνδρά μοὶ έννὲ, may have been found unseemly.

<sup>60</sup> Georgiades (n. 55) 98–121, points out that this is the rhythm of the commonest of modern Greek dances, the συρτός Καλαματιανός. See also S. Baud-Bovy, Revue de Musicologie liv (1968) 12.

<sup>61</sup> See Gnomon xlviii (1976) 5.

<sup>62</sup> See my Hesiod. Theogony (Oxford 1966) 438 ff.

<sup>63</sup> Mesomedes 1; Seikilos' song.

 $<sup>^{64}</sup>$  Cf. Wilamowitz, Pindaros (Berlin 1922) 339 n. He renders 'nach dem Faden seiner Verse', appealing to the fact that  $\dot{\rho}\dot{\alpha}\beta\delta\sigma$  can mean 'stripe' in woven fabric (Poll.

suggests an analogy between the staff and the cross-bar of a loom.<sup>65</sup> I have quoted Pausanias' phrase about Hesiod,  $\hat{\epsilon}n\hat{\iota}$   $\hat{\rho}\hat{\alpha}\hat{\beta}\delta ov$   $\delta\hat{\alpha}\phi\nu\eta_S$   $\hat{\eta}\delta\epsilon$ , where  $\hat{\epsilon}n\hat{\iota}$  must signify something more than 'holding'. Possibly the rhapsode turned his staff in different directions while he sang, as the Homeric orator apparently did while he spoke.<sup>66</sup>

The classical rhapsode did not restrict himself wholly to epic. Κλέαρχος δὲ ἐν τῷ προτέρῳ περὶ γρίφων (92 Wehrli) 'τὰ 'Αρχιλόχου' φησιν 'Σιμωνίδης ὁ Ζακύνθιος ἐν τοῖς θεάτροις ἐπὶ δίφρου καθήμενος έραψώδει'. Λυσανίας δὲ ἐν τῷ πρώτῳ περὶ ἰαμβοποιῶν Μνασίωνα τὸν ραψωδὸν λέγει ἐν ταῖς δείξεσι τῶν Σημωνίδου τινὰς ἰάμβων ὑποκρίνεσθαι. τοὺς δὲ Ἐμπεδοκλέους Καθαρμοὺς ἐραψώδησεν Ὀλυμπίασι Κλεομένης ὁ ῥαψωδός, ὧς φησιν Δικαίαρχος (87 W.)  $\dot{\epsilon}\nu \tau \dot{\omega}$  'Ολυμπικ $\dot{\omega}$ . These testimonia, however, relate only to the fourth century, or the end of the fifth at the earliest. In the archaic period the rhapsode's repertoire, like the citharode's, presumably included gnomic hexameter poetry such as Hesiod and Phocylides.<sup>68</sup> But there is no reason to think or expect that it included elegy or iambus. Elegy was everyday poetry, mainly composed for the symposium or other particular settings. So far as we can tell, the custom was to sing it to the pipes. 69 That implies conventional melodies, νόμοι, not an accentual rendering, since the piper can hardly have known in detail the words that the singer intended to sing. Iambus is a name that covers various kinds of popular performance. It had its own performers, buffoons and jesters. 70 Some of it involved simple song-forms, like the epodes of Archilochus and Hipponax. Some of the rest may have had musical accompaniment, but the attribution to Archilochus of  $\pi \alpha \rho \alpha \kappa \alpha \tau \alpha \lambda \delta \gamma \dot{\eta}$  (though this must have been on the basis of later practice) implies recitation which was not itself melodic.<sup>71</sup>

## IV. THE MODES (2)

Early citharodes, like early rhapsodes, were not all mere interpreters. Some of them were creative poets, who, especially in mainland Greece, developed a separate style of lyric epic, mainly dactylic but not in regular hexameters. The wider melodic range afforded by the seven-stringed instrument suited a larger unit than the hexameter line, and sizable strophes with a recognizable shape could be built up. This branch of the tradition surfaces in the west with Xenocritus of Locri and Stesichorus.<sup>72</sup> Stesichorus seems to imply that his Oresteia has a 'Phrygian' melody. 73 If this means that he is using the Phrygian scale recorded by Aristides Quintilianus, only without the divided semitones, that would be d e f a b c' d'. It contains the

vii 53). 'Recht alt, von Menaichmos von Sikyon (Schol. N. 2, 1) [FGrH 131 F 9] ist die Deutung, ράβδος wäre

στίχος; aber sie ist kaum mehr als ein Autoschediasma.'

65 The idea of poetry as something 'woven' (cf. Pind. N. iv 44, fr. 179, Bacch. v 9, xix 8) is Indo-European: see M. Durante, Rend. Acc. naz. Lincei xv (1960) 238 f. = R. Schmitt (ed.), Indogermanische Dichtersprache (Innsbruck

προπρηνές ενώμα, αλλ' αστεμφές έχεσκεν, αΐδρι φωτὶ ἐοικώς.

67 Ath. 602cd. Cf. Pl. Ion 531a, where Ion is asked whether he is an expert only on Homer or also on Hesiod and Archilochus. Dionysius I hired rhapsodes to perform his own poetry at Olympia (Diod. xiv 109).

68 Cf. JHS xcviii (1978) 164 with n. 3. For Hesiod sung to the lyre cf. also Plut. Quaest. conv. 736e.

69 See my Studies in Greek Elegy and Iambus (Berlin

1974) 12–14.

70 I must refer to the second chapter of the work just

71 Ps.-Plut. 1141a. Theoc. epigr. 21. 5 f. celebrates

Archilochus as ἐπιδέξιος ἔπεά τε ποιεῖν πρὸς λύραν τ' άείδειν. Phillis of Delos (Ath. 626b) knew a stringed instrument called ἰαμβύκη, to which τοὺς ἰάμβους ηδον.—Nothing useful can be inferred from D.L. ix 18 on Xenophanes, γέγραφε δὲ ἐν ἔπεσι καὶ ἐλεγείας καὶ ιάμβους . . . ἀλλὰ καὶ αὐτὸς ἐρραψώδει τὰ ἑαυτοῦ.

<sup>72</sup> Cf. CQ xxi (1971) 306–14.

<sup>73</sup> PMG 212. 2, quoted above (n. 49). This is consistent with Glaucus of Rhegium's statement (fr. 2 Lanata, ap. Ps.-Plut. 1133f) that Stesichorus used the άρμάτειος νόμος, which derived from the Phrygian Olympus. The Phrygian slave in Orestes 1384 calls his song άρμάτειος νόμος, and as he keeps emphasizing the barbarian nature of his lament, the mode was presumably the Phrygian. The scholiast identifies it with the νόμος ' $A\theta \eta v \hat{a}$ s, and we are told that this was in the Phrygian mode (Ps.-Plut. 1143b). Alexander was so aroused by the sound of the άρμάτειος νόμος played on the pipes that he rushed for his weapons (Plut. Alex. fort. aut virt. 335a): cf. Cassiod. Varia ii 40 Phrygius (modus) pugnás excitat et vótum furóris inflammat.

four notes conjectured for the Homeric phorminx, supplemented by fifths below Mese (d) and above Hypate and Lichanos (b, c').

Did this augmentation contain anything genuinely Phrygian? Was the Lydian mode genuinely Lydian? The names cannot have been completely arbitrary. On the other hand Aristides' old scales all show a distinct family likeness. They all have the same basic tetrachord, and other notes derived from it on similar principles. The ones with Greek names have no common feature which distinguishes them from the ones with barbarian names, or *vice versa*. Judging on the basis of these scales, we should be inclined to say either that the 'barbarian' modes had become hellenized to a degree which we are unable to control, or that they were really Greek in origin and received their designations on account of superficial resemblances to Lydian or Phrygian styles of music. Certainly instruments and performers came in from Anatolia: in the early archaic period the Lydian harp, and Phrygian pipers. The But we should take note of the judgment of the author of a wide-ranging survey of primitive music:

Native elements and those borrowed from other cultures often exist side by side within one tribe. Nevertheless, foreign forms are not adopted so much as is generally supposed. Even when two races of different culture are in constant economic or military contact there is little evidence that they adopt each other's musical forms. It is true that a tribe that is stronger economically or militarily often uses musicians from subject tribes for its festivities . . . but the degree of reciprocal influence appears to be relatively small. Even when foreign musical instruments are adopted, the relevant literature seems to be taken over only to a small extent or in mutilated form.<sup>75</sup>

The applicability of these generalizations to archaic Greece is supported by the evidence of metre. For all their diversity, the metres of archaic poetry appear as branches of a single national tradition which can be traced back to Indo-European origins.<sup>76</sup> If the metre and rhythm of archaic music is all Greek, foreign influence on that music cannot go very deep.

The Dorian scale differs from the Phrygian only in that the top note is a tone higher, a fifth above Mese instead of a fourth. The invention of this 'Dorian Nete' was ascribed to Terpander, together with  $\delta$   $\tau \hat{\eta} s$   $\delta \rho \theta iov$   $\mu \epsilon \lambda \omega \delta ias$   $\tau \rho \delta \pi os$  (Ps.-Plut. 1140f., cf. Arist. Probl. xix 32). The so-called  $\delta \rho \theta ios$   $v \delta \mu os$  involved high notes, 77 and the Dorian Nete, a major third above the next highest note, was the most taxing. The  $\delta \rho \theta ios$   $v \delta \mu os$  perhaps differed from other music in the Dorian scale not in absolute pitch but in tessitura, in the frequency with which the higher notes were required. In the terminology of Aristides Quintilianus it was  $v \eta \tau o \epsilon i \delta \eta s$ . 78

References in classical poets and in Plato to particular modes being high or low are perhaps capable of interpretation along these lines. Thus when Lasus says he is singing  $Aio\lambda i\delta$   $a\mu$   $\beta a\rho i\beta \rho o\mu o\nu a\rho \mu o\nu ia\nu$  (PMG 702. 3), he may mean not that the Aeolian mode belongs in a low register, but that it is  $i\pi a\tau o\epsilon i\delta \eta s$ . The pitch at which a song was sung must have depended chiefly on the singer's vocal register and on the instrument used in its accompaniment. The barbitos, for instance, had a lower register than the ordinary lyre, and some auloi were deeper in tone than others. No doubt there was an association between choice of instrument and mode. But there is no reason to suppose that the three modally contrasted movements of the  $\tau \rho \iota \mu \epsilon \lambda \eta s$ 

<sup>&</sup>lt;sup>74</sup> The Lydian harp: Pind. fr. 125, Soph. fr. 412 Radt, Diogenes TrGF 45 F 1. 6 ff. Phrygian pipers: besides the legendary Olympus, Marsyas, and Hyagnis, cf. Ath. 624b, and Hipponax 163.

<sup>&</sup>lt;sup>75</sup> M. Schneider (n. 25) 29.

<sup>&</sup>lt;sup>76</sup> See *Glotta* li (1973) 161–87; *CQ* xxiii (1973)

<sup>179–87.

&</sup>lt;sup>77</sup> Arist. Probl. xix 37 οἱ νόμοι ⟨οἱ⟩ ὄρθιοι καὶ οἱ ὀξεῖς χαλεποὶ ἀσαι διὰ τὸ ἀνατεταμένοι εἶναι.

<sup>78</sup> P. 28. 12 W.-l. He characterizes the nomic style

generally as  $\nu\eta\tau$ oειδής, the dithyrambic as  $\mu$ εσοειδής, the tragic as  $\dot{\nu}\pi$ ατοειδής, p. 30. 1–4.

 <sup>79</sup> Other passages are Pratinas 712(a) μήτε σύντονον δίωκε μήτε τὰν ἀνειμέναν {'Ιαστί} μοῦσαν, ἀλλὰ τὰν μέσαν νεῶν ἄρουραν αἰόλιζε τῷ μέλει (not quite in accord with Lasus); Telestes 810. 4 τοὶ δ' ὀξυφώνοις πηκτίδων ψαλμοῖς κρέκον Λύδιον ὕμνον; Pl. Rep. 398e, Arist. Pol. 1340a40 ff., 1342b20 ff., cf. 1290a19 ff. 80 Barbitos: Pind. fr. 125 says Terpander invented it,

inspired by the Lydian harp's  $\psi \alpha \lambda \mu \delta s$   $\delta \nu \tau i \phi \theta \delta \nu \gamma \delta s$ , i.e. its octave chords, its doubling of the melody in the bass. Auloi: Poll. iv 81, Ath. iv 174f–182e, Aristid. Quint. p. 85. 4 ff W.-I.

νόμος ascribed to Sacadas or Clonas<sup>81</sup> were played at different pitches, or that the modulations achieved by Pythagoras of Zacynthus on his 'tripod' (Ath. 637c) involved changes of register. It is true that in later theory the names Dorian, Lydian, etc., are applied not only to different modes (in the sense of octave-species) but to different keys (in the sense of pitches at which Mese and the other notes are played). But this is a device to counteract the spurious differences of pitch implied by treating the modal scales as different, overlapping segments from a single universal scale.<sup>82</sup>

This universal scale was the end product of long struggles to solve the practical difficulties of modal convertibility. To appreciate these difficulties we must forget our modern way of thinking, according to which the whole range of musical pitch is mapped out in grid fashion. For us each note in the octave, with its sharps and flats, exists at a fixed pitch with a definite identity, and each octave is succeeded by another above and another below. The Greek invention of the Perfect System was a major step in this direction. But in the archaic period the note produced by a particular lyre-string or pipe had no identity except in relation to the other notes given out by the same instrument in the same melody. The  $\delta \rho \mu o \nu i a \nu$  existed in a void. We for convenience may represent the reconstructed Phrygian heptatonic scale, with its intervals of 1,  $\frac{1}{2}$ , 2, 1,  $\frac{1}{2}$ , 1 tones, by defabc'd', and the Lydian  $(\frac{1}{4}, 2, 1, \frac{1}{2}, 2, \frac{1}{4})$  by  $\bar{A}$  B defa  $\bar{a}$ , giving the two scales four notes in common; but for the player on a seven-stringed lyre, who kept his strings in order of pitch, changing from the one  $\delta\rho\mu\nu\nu$ ia to the other meant re-tuning at least five strings. If the Phrygian tuning was defabc'd', the Lydian might be  $\bar{e}^{b}$  e  $a^{b}$  b  $e^{b'}$   $\bar{e}^{b'}$ , or  $\bar{c}$  c# f g g# c'  $\bar{c}'$ . To minimize the inconvenience which such re-tunings involved, musicians must have striven to find as much common ground between different modes as they could, and to identify certain notes in one where possible with notes in another; different results were obtained at different times. The process began quite early. Alcman's eleven Sirens may represent an early Perfect System, since eleven is the number of notes required to accommodate the heptatonic Dorian, Phrygian, and Lydian scales.<sup>83</sup> The Athenian Lamprocles in the first half of the fifth century is said to have 'realized' that the Mixolydian mode 'does not have its διάζευξις (the tone between Mese and Paramese) where it was generally thought to, but high up', and to have established its form as that of the note-series from Paramese down to Hypate Hypaton (Ps.-Plut. 1136d). The terminology is very probably anachronistic, but the meaning is not in doubt. 84 Earlier musicians had evidently matched the scales like this:

```
Mixolydian
Phrygian
Dorian
```

—taking the obvious course of lining up the trichords e f a, and equating the Mixolydian top note with the Dorian, but at the expense of introducing an awkward g and bb into the sequence. Lamprocles achieved a better fit by equating the upper fifth of the Mixolydian with the fifth from Hypate to Paramese in the others:

```
Mixolydian Bcdef b
Phrygian
              defabc'd'
```

etc. This bold departure, this discovery of the principle of modulation by transposition, opened the way towards the later Perfect Systems, and also towards the invention of modulating instruments. As the experiments of Sacadas and Pythagoras of Zacynthus show, musicians were well aware of the effects to be got by modal contrast. But instant modulation was not a practical proposition until the creation of an extended scale of which different segments yielded different

<sup>81</sup> Ps.-Plut. 1134ab. Xylander's  $au
ho\iota\mu\epsilon\lambda\hat{\eta}$  and  $au
ho\iota$ μελουs for τριμερ-, after 1132d, makes the name more meaningful, and fits the early use of  $\mu \epsilon \lambda os$  for 'mode' seen in Alcm. 126, Stes. 212, Prat. 712(a).

<sup>82</sup> See Winnington-Ingram (n. 38) 49 ff.

<sup>83</sup> Alcm. 1. 96-9. This improves on the musical

interpretation put forward in CQ xvii (1967) 11 f. I referred there to the Pythagorean symbolon τί ἐστι τὸ έν Δελφοίς μαντείον; τετρακτύς, ὅπερ ἐστὶν ἡ ἀρμονία, ἐν ἡ αἱ Σειρῆνες, and to the eight Sirens who sing the notes of the octave in Pl. Rep. 617b.

84 Cf. J. Chailley, Acta Musicologica xxviii (1956) 157.

modes. This was the precondition for Pronomus' multimodal pipes<sup>85</sup> and for the elevenstringed modulating lyre hailed by Ion of Chios.86

Aristides gives note-values for his six old scales which imply the following tabulation; he is thought to have taken them over from his source. 87 (The bracketed c in the Phrygian is added from the Orestes fragment.)

```
Syntonolydian B B c
                            ВБсе
Ionian
                            B B c de ē f

      B c d e ē f
      b

      B c e f# f# f* b b

      (c) d e ē f
      a b b c' d'

      d e ē f
      a b b c'

Mixolydian
Lydian
Phrygian
Dorian
```

Consider this table from the point of view of someone designing a Perfect System. The first two scales can be ignored, as they merely duplicate notes contained in the others. Combination of the rest gives us a System

B 
$$\bar{B}$$
 c d e  $\bar{e}$  f f#  $\bar{f}$ #- g a b  $\bar{b}$  c' d' e'

Intervals:  $\frac{1}{4}$   $\frac{1}{4}$  I I  $\frac{1}{4}$   $\frac{1}{4}$   $\frac{1}{2}$   $\frac{1}{4}$   $\frac{1}{4}$  I I  $\frac{1}{4}$   $\frac{1}{4}$  I I

What is distasteful here is the crowd of small intervals between e and g. It reminds us of the καταπύκνωσις which Aristoxenus complains of in his predecessors' systems (Harm. vii 2, xxxviii 2). It is only the Lydian scale that makes it so. The difficulty is solved by transposition, as it had been with Mixolydian. Compare the corresponding part of Aristoxenus' enharmonic table:

```
Mixolvdian
           B B c e ē f a b
             Bc eēf abb
Lydian
               c eēf abbc'
eēf abbc' e'
Phrygian
Dorian
                    ēf ab bc' e' ē'
Hypolydian
```

Aristides' Lydian has been shifted up to become 'Hypolydian' ē-ē', and its place taken by a new 'Lydian', perhaps created for the sake of the scheme. Other adjustments have been made. The Dorian pattern of successive symmetrical tetrachords of the form  $\frac{1}{4}$  and  $\frac{1}{4}$  a has been imposed on the whole System, in order to achieve a clear separation between the enharmonic and diatonic genera. Mixolydian, Phrygian and Dorian have accordingly been purged of their d (in the case of Dorian this has the advantage of reducing it to an octave); Phrygian suffers most from this Procrustean operation, losing its upper d'as well. The enharmonic Phrygian in this revised form c-c' probably had no more than a theoretical existence. Aristoxenus found that  $\pi \rho o \sigma \eta \kappa \epsilon \iota \epsilon \tilde{v}$ μάλιστα τὸ ἐναρμόνιον γένος τἢ Δωριστὶ ἁρμονία καὶ τἢ Φρυγιστὶ τὸ διάτονον (ap. Clem. Str. vi 88). To account for the genuine Phrygian as used in tragedy, and for the anomalous d in its Dorian and Mixolydian numbers, it was necessary to say that the tragedians employed, besides the enharmonic genus, a mixture of the enharmonic and diatonic.88

Aristoxenus' series of octave-species continues with Hypophrygian f-f' and Hypodorian

μελοποιία γένει μεν τῷ ἐναρμονίῳ ἐχρήσατο ἀμιγεῖ καὶ μικτῷ γένει τῆς ἀρμονίας καὶ δι<α>τόνων, χρώματι δὲ οὐδεὶς φαίνεται κεχρημένος τῶν τραγικών ἄχρις Εὐριπίδου. Dorian and Mixolydian are given as the modes chiefly used in earlier tragedy (Aristox. fr. 81 ap. Ps.-Plut. 1138d; Psellus loc. cit.). The Phrygian was introduced to the theatre by Sophocles (Aristox. fr. 79 ap. Vit. Soph. 23, Psellus loc. cit.).

<sup>85</sup> Paus. ix 12. 5, Ath. 631e.

<sup>86</sup> Fr. 32. The συμφωνοῦσαι άρμονίας τρίοδοι are nodal points from which the player could choose which modal path to take. When Pherecrates fr. 145 speaks of Phrynis getting twelve άρμονίαι on five strings, this may be a comic inversion of 'five άρμονίαι on twelve strings', which would be credible.

87 Laloy (n. 38) 33; Winnington-Ingram (n. 38) 27.

 $<sup>^{88}</sup>$  Psellus  $\pi$ . τραγ. 5 ή δὲ παλαιὰ τραγική

a-a'. These are presumably related to the modes of the same names introduced to tragedy by Agathon and said to be dithyrambic in character.<sup>89</sup> As they stand, they can be analysed



The Hypo-names seem explicable only in the light of the schematic System, where the sequence Lydian-Phrygian-Dorian is continued by Hypolydian-Hypophrygian-Hypodorian, each Hypo-scale being a fourth higher in the System (and hence a fourth lower on the scale of  $\tau \acute{o}\nu o\iota$ ) than its eponym. Hypolydian, as we have seen, had been a 'Lydian' scale in name and character, but Hypophrygian and Hypodorian do not appear closely related to Phrygian and Dorian, and may once have had other names. Heraclides Ponticus (ap. Ath. 624e) identified the Hypodorian with the old 'Aeolian', on the ground that Lasus' 'Aeolian' song (above, p. 126) was sung in Hypodorian. Later writers of the Aristoxenian tradition identify it with the Locrian mode, which was said to have been invented by Xenocritus of Locri. <sup>90</sup> As Xenocritus was in some sense a forerunner of Stesichorus, it is interesting to note the similarity between the Hypodorian scale, de ē f a ā b d', and the Phrygian, de ē f a b b c' d'. Both have Mese + 4 as well as Mese - 5, and they differ only in that Phrygian also has Hypate + 5, with leading-notes over it instead of over Mese.

Our understanding of the archaic and classical modes remains extremely sketchy. Although they underlie Aristoxenus' neat scheme of octave-species and keys, we should really have no conception of what they were like but for the precious page of Aristides Quintilianus that preserves the scales of oi  $\pi \acute{a}\nu \upsilon \pi a\lambda a \iota \acute{o}\tau a\tau \upsilon \iota$ . But that page gives us the means to break into a lost world. The ground is marshy, and we must tread carefully. But we should not be too timid to enter. 91

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name fell into disuse.

<sup>89</sup> Psellus loc. cit.

<sup>&</sup>lt;sup>90</sup> Cleonid. p. 198. 13, Bacchius p. 309. 9, Gaudentius p. 347. 10 Jan. Xenocritus: schol. Pind. O. xi 17. Ath. 625e says the Locrian mode was neglected after the time of Pindar, but this may be based on the fact that the

<sup>&</sup>lt;sup>91</sup> I owe gratitude to Professor R. P. Winnington-Ingram not only for much illumination from his published work but also for reading the present article and saving me from some errors.



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άρμονία and τόνος in Greek Music

Author(s): J. E. Sandys

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## άρμονία AND τόνος IN GREEK MUSIC.

In the interesting and instructive volume on the Modes of Ancient Greek Music, lately published by the Clarendon Press, the Provost of Oriel maintains that there was no such distinction as that which Westphal and others have drawn between ancient Greek 'modes' (ἀρμονίαι) and 'keys' (τόνοι οτ  $\tau \rho \acute{\sigma} \pi o\iota$ ). Among the reasons which Mr. Monro adduces in support of their identity is the fact that Plutarch was apparently not aware of any difference of meaning between  $\tau \acute{o}\nu os$  and ἀρμονία (l.c., p. 26). This is inferred from a comparison of three passages in his

J. E. SANDYS.

#### THE MUSIC OF THE ORESTES.

In his article on the Orestes papyrus in the last number of this *Review*, pp. 313-317, Mr. Abdy Williams has been following Dr. Wessely with rather too much confidence. The transcript will not bear examination.

1. He says that the notes for the accompaniment are mingled with the text. That would be unprecedented. In the nine fragments from Delphi with notes for instruments the notes are written above the text; and so also in the Kircher and Marcello MSS. He says that the notes here are J, J, and Z. Whenever the so-called Z occurs in the text, it comes between the last word of one verse and the first word of the next verse; so this must be a species of κορωνίς for marking off the verses. The ) and 7 occur, with other fragments of letters, in the interval between κατέκλυσεν and ως πόντου, where δεινων πόνων should be read; so they are blunders of the scribe. Obviously, the scribe was puzzled by the half-verse ἀνὰ δὲ λαῖφος ως, and completed it with the half-verse  $\tau is \, \dot{a} \kappa \dot{a} \tau ov \, \theta o \hat{a} s$ , beginning the next verse at τινάξας and adding the Z above the line. And then he made this muddle of the text, beginning a fresh verse at  $\dot{\omega}_{S} \pi \dot{o} \nu \tau o \nu$  with the Z again above the line.

2. Mr. Abdy Williams says that the ictus dot is placed above the musical sign, or alongside it, according to exigencies of space. It is always above the punctuating Z, and alongside the musical sign that follows the Z. Thus,  $\dot{\mathbf{Z}}$  and  $\mathbf{P}$  in lines 1, 2;  $\dot{\mathbf{Z}}$  and  $\mathbf{P}$ 

in 3, 4, and again in 5, 6, and 11; and  $\dot{\mathbf{Z}}$  and  $\dot{\mathbf{Q}}$  in 7. Thus the plain dot marks the first note in a verse, while the combined dot and dash mark the first note in the fourth foot. The dot and dash occur in lines 5, 7, 9, as printed in the transcript; and a photograph shows traces of them above the first  $\Pi$  in line 1. They are required above the first  $\mathbf{Z}$  in line 3, but here the photograph shows hardly any traces of the  $\mathbf{Z}$  itself.

3. In determining the values of the notes, he treats the  $\mu a$  in  $\mu a \tau \epsilon \rho o_S$  as a short syllable; the  $\chi \epsilon \nu$  in  $\mathring{a} \nu a \beta a \kappa \chi \epsilon \nu \epsilon \iota$ , the  $\delta a \iota$  in  $\delta a (\mu \omega \nu)$ , and the  $\pi o \nu$  in  $\pi \acute{o} \nu \tau o \nu$ , as two short syllables each; the word  $\mathring{\omega}_S$  as two long syllables; and the  $\nu \omega \nu$  in  $\delta \epsilon \iota \nu \mathring{\omega} \nu$  as a short and a long. No doubt the  $\mathring{\omega}_S$  is split, for this is written as  $\mathring{\omega}_S$ : but if the other syllables were split, they would be written accordingly. Moreover, a long syllable always splits into two shorts, as may be seen from the Delphic hymns.

4. As regards the notes for voices, he follows the usual system in giving e for  $\Gamma$ , g for  $\varphi$ , a for  $\Gamma$ , g for  $\varphi$ , a for  $\Gamma$ , whereas  $\Gamma$  was the lower of the two notes that came between e and f; and in line 11 he treats the punctuating  $\Gamma$  as a note for voices. He also gives by for  $\Gamma$  and makes  $\Gamma$  a quarter-tone between  $\Gamma$  and  $\Gamma$  and  $\Gamma$  are involves the enharmonic scale with intervals of a quarter of a tone apiece; but the notation will also suit the chromatic scales with intervals of three-

eighths or a third of a tone apiece, besides other chromatic and enharmonic scales with more complicated intervals.

- 5. As regards the alleged notes for instruments, he follows the usual system in giving g for Z. But he gives f for I, whereas I was a note between e and f; and he also gives b for I, thereby involving the enharmonic scale with intervals of a quarter of a tone apiece.
  - 6. He transcribes the music into the no-

tation that is now in use; and this is associated with an octave of twelve equal intervals. But in Greek music the intervals were not the same; so the notes are not exactly in their places.

The comparisons with modern music appear to be illusory. They are not founded on the ancient music as it stands, but on a transcript which twists it into modern shape.

CECIL TORR.

#### NOTE ON THE HOMERIC HYMN TO HERMES V. 33.

In the current Hermathena, in a review of Goodwin's Homeric Hymns among other conjectures I have put forward one (on Hermes v. 33) which has been fortunate enough to command the assent of many of my friends. I avail myself here of the courtesy of the Editor of the Classical Review to make a slight improvement on it. The note ran thus:—

In v. 33 there is, as it seems to us, room for a certain conjecture, though, strange to say, the needfulness of a correction has not struck any of the editors. Hermes, addressing the tortoise out of whose shell he afterwards fashioned the lyre, exclaims:—

πόθεν τόδε, καλδν ἄθυρμα, αἰόλον ὅστρακον ἐσσί, χέλυς ὅρεσι ζώουσα;

But 'how came it that thou art a shell?' is unmeaning. Read ἔσσο for ἐσσί. The tortoise was not the shell much more than a man is his great-coat. One is reminded of the joke ascribed to Mr. Gilbert when in reply to 'You wear a great-coat?' he said, 'No, I never was.' But 'thou art clothed with this shell' at once recalls the λάινον ἔσσο χιτῶνα of Γ 57.

The punctuation given above, which is that of most editions, compels us to give to  $\pi \delta \theta \epsilon \nu$  the sense of qui fit ut? not of unde? Now this sense of  $\pi \delta \theta \epsilon \nu$  is posthomeric.

This is not a serious objection, for every reader of the hymns knows that they abound in posthomeric usages. But a slight change of punctuation improves the construction; read:—

πόθεν τόδε καλὸν ἄθυρμα; αἰόλον ὅστρακον ἔσσο χέλυς ὅρεσι ζώουσα.

'Whence this pretty plaything? Curiously wrought (or, sheeny,) is the shell wherewith thou art clothed upon, thou tortoise of the field.' The punctuation which I now recommend is, I find, that of Gemoll's edition.

It would be quite impossible with the ordinary punctuation to take  $\pi \delta \theta \epsilon \nu$   $\epsilon \sigma \sigma \delta \epsilon$  together = unde es? To this  $\tau \delta \delta \epsilon$  is fatal;  $\tau \delta \delta \epsilon$  would be awkward, but  $\tau \delta \delta \epsilon$  would not be Greek, unless we could write  $\pi \delta \theta \epsilon \nu$   $\delta \delta \epsilon$   $\sigma \delta \epsilon$   $\delta \epsilon$ 

R. Y. TYRRELL.

## THE MODERN GREEK WORD νερό.

In a note in the Classical Review of March (p. 100) Mr. A. N. Jannaris says that the modern Greek word  $\nu\epsilon\rho\delta$  has no connexion with the ancient  $\nu\eta\rho\delta$ ,  $N\eta\rho\epsilon\delta$ , but is nothing but a phonetic modification of  $\nu\epsilon\alpha\rho\delta\nu$  'fresh,' sc.  $\delta\delta\omega\rho$ . I should like to point out that Prof. Krumbacher at Munich, three years ago, proposed the same etymo-

logy. In the edition of the Colloquium Pseudo-Dositheanum Monacense inserted by Krumbacher in the Abhandlungen aus dem Gebiet der classischen Altertumswissenschaft, W. von Christ dargebracht (München, 1891), p. 362 seqq. (in a note to 'πίωμεν νερὸν ἐκ τοῦ βανκιδίου bibamus recentem de gillone'), we find the explanation of νερόν from νεαρόν



Some Problems in Musical Terminology Author(s): E. K. Borthwick

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## SOME PROBLEMS IN MUSICAL TERMINOLOGY

In addition to the technical writers on music, a number of ancient authors, notably Plutarch and Athenaeus, have recorded several musical terms, either by way of illustrative material—Plutarch is particularly given to musical similes and metaphors—or in the course of anecdotes about music and musicians. As musical terminology in different ages contains words or phrases not only of general acceptance and familiarity, but other more ephemeral expressions which belong to the jargon of a narrower circle of executants and critics, it is possible that the musical significance of such words, when used in an apparently non-musical context, has escaped notice.<sup>1</sup>

Stratonicus was a fourth-century professional musician of some notoriety, and probably an important figure in the development of kithara technique. (Athen. 352c, quoting Phaenias the Peripatetic: Στρατόνικος ὁ Ἀθηναῖος δοκεῖ τὴν πολυχορδίαν εἰς τὴν ψιλὴν κιθάρισιν πρῶτος εἰσενεγκεῖν καὶ πρῶτος μαθητὰς τῶν ἀρμονικῶν ἔλαβε καὶ διάγραμμα συνεστήσατο.) He was apparently an indefatigable travelling virtuoso, much given to bons mots, with a penchant for puns² and for deflating people (often his fellow musicians, or provincials both high and low whom he encountered on his concert tours), and was so admired for the εὐστοχία τῶν ἀποκρίσεων³ that the poet Machon and Callisthenes, a compiler of ἀπομνημονεύματα, made collections of his witticisms some of which Athenaeus preserves.⁴ Like so many jokes of antiquity they are sometimes funny,⁵ sometimes feeble, and not seldom require learned attempts at clarification. Not all these anecdotes are about musical matters, and in this category at first glance is the story in Plutarch's De exilio (Mor. 602 a):6

Στρατόνικος δὲ τὸν ἐν Σερίφω ξένον ἠρώτησεν, ἐφ' ὅτω τῶν ἀδικημάτων φυγὴ τέτακται παρ' αὐτοῖς ἐπιτίμιον ἀκούσας δ' ὅτι τοὺς ῥαδιουργοὺς φυγαδεύουσι, 'τί οὖν' εἶπεν 'οὐκ ἐρραδιούργησας, ὅπως ἐκ τῆς στενοχωρίας ταύτης μεταστῆς;'

The joke about committing some crime to gain immediate physical comfort is mildly amusing and has its modern equivalents, but in the mouth of the musician Stratonicus the unusual phraseology (ἐρραδιούργησας . . . στενοχωρίας) has a secondary allusive meaning which was probably intentional, for these words seem to have been cant terms in connexion with the musical innovations

- <sup>1</sup> Cf. my article in C.Q. N.S. ix (1959), 23 ff., where I resuscitated κατάληψις (Ar. Nu. 318) as a fifth-century musical term, and the new light shed on Plut. Mor. 968 ab by the recent discovery of ἀνάτρητος as a musical term (see R. Browning, A Byzantine Treatise on Tragedy, in Geras: Studies presented to George Thomson on the occasion of his 60th birthday, p. 77).
- <sup>2</sup> e.g. Strabo. 610 (ἄσσον ἴθι); Athen. 348 e (ἀκούετε, νεώ), 350 c (σκῆπτρον-πλῆκτρον), 350 d (δοκῶ-δοκοί), 350 f (άρμο-νίαν-Κάδμον), 351 c (εἰς Μακεδονίαν), 351 d (ἄρδοι-ἔρδοι), 352 a (πόλις-μόλις), 352 b

 $(\psi \dot{\alpha} \lambda \lambda \epsilon - \beta \dot{\alpha} \lambda \lambda \epsilon)$ .

- <sup>3</sup> Athen. 348d.
- 4 347 f-352 d. Cf. Gow, Machon fr. xi.
- <sup>5</sup> One at 350 a is curiously modern in its humour: ἐπερωτηθείς...πότερα Βοιωτοὶ βαρβαρώτεροι τυγχάνουσιν ὅντες ἢ Θετταλοί, 'Ηλείους ἔφησεν.
- <sup>6</sup> The anecdote immediately preceding this in Plutarch's essay—Diogenes the cynic's magnificent riposte to the Sinopeans—happens to make the identical point to Stratonicus' reply to the king of Pontus (Machon ap. Athen. 349d).

4599.1

The terms ὀλιγοχορδία, πολυχορδία, ποικιλία are commonplaces in such contrasts of the severity of the ancient style with its restricted compass, and the more flamboyant 'panharmonic' style of the new music; and it is probable that στενοχωρία too was used at this period to describe the former, although it chances to have survived only in this extract from the *De musica*. The source, as in so many places in the dialogue, is likely to have been Aristoxenus (see Weil–Reinach's note, p. 73), just as Nicomachus' reference to the *Cheiron* of Pherecrates is, like the long quotation from it in Plut. *De Mus*. 1141 d–1142 a, drawn from a much earlier history of musical innovations (see Lasserre's note, p. 172).

Among other passages which refer to a restricted compass or small number of notes (or strings) are Ion of Chios fr. 6D, where he contrasts the hendecachord lyre of the new music with the σπανία μοῦσα of the heptachord lyre (cf. Timotheus' own ρυθμοὶ ένδεκακρούματοι in Pers. 242); Ar. fr. 659 οὐχ οἶα πρῶτον ήδον έπτάχορδα πάνθ' όμοῖα; Plut. Mor. 1135d (on innovations of Timotheus, etc.) την γαρ ολιγοχορδίαν και την άπλότητα<sup>3</sup> και σεμνότητα της μουσικής παντελώς ἀρχαϊκὴν είναι συμβέβηκεν; ibid. 1137b (on the music of Olympus and Terpander) τρίχορδα γὰρ ὄντα καὶ ἀπλᾶ διαφέρει τῶν ποικίλων καὶ πολυχόρδων; Athen. 638a (quoted below, n. 1) on the συντομία of solo kithara music before Lysander of Sicyon; Plato Leg. 812d, where he mentions as a fault in contemporary musical practice the combination of πυκνότητα μανότητι in kitharodia, where homogeneous clusters of notes are combined with widely spaced intervals. In this passage μανότης is, like στενοχωρία, unique in a musical context, but Aristides Quintilianus (11. 22 and 14. 24 W.-I.) mentions ἀραιά and πυκνά διαστήματα or συστήματα. The recently published Byzantine treatise on tragedy, tentatively ascribed to Psellus,5 contains the statement (§ 5) συστήμασι δὲ οἱ μὲν παλαιοὶ μικροῖς ἐχρῶντο, Εὐριπίδης πρῶτος πολυχορδία

Finally, as the employment of 'many notes' on the kithara is traditionally ascribed to the influence of aulos music we may note that Plutarch's quotation of the Pherecrates fragment is introduced by the statement (1141 d)  $0\tilde{v}\tau$ 0s  $\gamma \dot{a}\rho$  (Timotheus),  $\dot{\epsilon}\pi\tau a\phi\theta\dot{o}\gamma\gamma ov \tau \hat{\eta}s$   $\lambda\dot{v}\rho as \dot{v}\pi a\rho\chi o\dot{v}\sigma \eta s \dot{\epsilon}\omega s \dot{\epsilon} s T\dot{\epsilon}\rho\pi av\delta\rho ov \tau \dot{v}v$   $\Delta v\tau \iota\sigma\sigma a\hat{\iota}ov$ ,  $\delta\iota\dot{\epsilon}\rho\rho\iota\dot{\psi}\epsilon v \dot{\epsilon}\dot{\iota}s$   $\pi\lambda\dot{\epsilon}\dot{\iota}ovas$   $\phi\theta\dot{o}\gamma\gamma ovs$ , which picks up the previous

<sup>1</sup> Mor. 1137a: cf. Athen. 638a on Lysander the Sicyonian kitharist περιελών τὴν συντομίαν τὴν ὑπάρχουσαν ἐν τοῖς ψιλοῖς κιθαρισταῖς.

<sup>&</sup>lt;sup>2</sup> p. 274 Jan.

<sup>&</sup>lt;sup>3</sup> Cf. also the  $\dot{a}\pi\lambda o \dot{v} \sigma \tau \epsilon \rho a \ \mu \dot{\epsilon} \lambda \eta$  composed for the old citizen choruses before the rise of professionalism in [Arist.] Pr. 19. 15.

<sup>4</sup> Cf. Phrynichus *P.S.* 59B. μανόν· τὸ ἀραιὸν οὖτω λέγουσιν οἱ Ἀθηναῖοι τὴν πρώτην συλλαβὴν ἐκτείνοντες. Plutarch (Mor. 136 f) uses πυκνός and μανός of tempo. (Cf. Eucl. Sect. Can. p. 148. 10 Jan.)

<sup>&</sup>lt;sup>5</sup> See p. 145, n. 1.

<sup>&</sup>lt;sup>6</sup> See p. 152, n. 4.

paragraph about Lasus who τη των αὐλων πολυφωνία κατακολουθήσας, πλείοσί τε φθόγγοις καὶ διερριμμένοις χρησάμενος, εἰς μετάθεσιν την προϋπάρχουσαν ήγαγε μουσικήν.<sup>1</sup>

As to the word ράδιουργεῖν in the Plutarch anecdote, it is generally assumed that the crime referred to is fraud or forgery (Hesych. ράδιουργός· πλαστογράφος; Plut. Pyrrh. 6, etc.) but the word also applies to a wider range of moral delinquency (Hesych. also glosses πονηρός, μηχανουργός, πολυμήχανος), basically pejorative, yet with the implications of our euphemism 'free and easy'. It shares therefore with terms like ἄνεσις, ἀνειμένος, μαλακός, χαλαρός, (κατα-) κεκλασμένος, κατεαγώς, τρυφερός, θρύπτω, etc., used of musical innovation, the suggestion of the relaxation or even moral corruption² of the severity and propriety of the 'classical' style. The ράδιουργία περὶ τὰ μέλη to which Nicomachus refers is best exemplified in the long fragment of Pherecrates' Cheiron (fr. 145) quoted by Plutarch (Mor. 1141d) in which the debauching of Music by Timotheus and the rest is described in musical terminology involving a series of amusing allusions à double entente or in Ran. 1301 ff. where Aristophanes abuses Euripides for the licentious and immoral nature of his lyrics, ἀνὰ τὸ δωδεκαμήχανον Κυρήνης μελοποιῶν.³

I suggest then that Stratonicus in his witticism was being ironical not simply about the physical rigours of life on Seriphus, but alluded also to its cultural backwardness.<sup>4</sup> For although he himself could be flippant at Timotheus' expense (Athen. 352a), as a leading modernist and specialist in the new polychordia he is likely to have been coolly received by provincials whose musical taste was doubtless aggressively conservative. It is a familiar situation in the musical history of every age, typified unerringly by Aristophanes in the argument between Strepsiades and his son (Nu. 1353 ff.). If the conversation reported by Plutarch took place in such circumstances, then the musical allusion which could come naturally enough to Stratonicus makes his remark wittier.

It is possible that the pejorative application of the term ράδιουργία<sup>5</sup> to music appears in one other place, in the metaphor of Themistius Or. 5 (p. 100. 11 Downey): πέφυκεν ἄνθρωπος, ὅσα μὲν καὶ πρὸς ἄμιλλαν διαπράξεται, συντονώτερον ἀπεργάζεσθαι, ὅσα δὲ ἄνευ φιλονεικίας, ταῦτα ράδιουργεῖν, since σύντονος (as opposed to ἀνειμένος, χαλαρός, etc.) is among the commonest musical words used metaphorically.

<sup>1</sup> The meaning of διαρρίπτω here is in dispute. Weil-Reinach translate πλείοσί τε φθόγγοις, κτλ. 'en employant des notes plus nombreuses et plus espacées' and in their note add 'répartis sur une grande échelle' in explanation of διερριμμένοις. Lasserre translates 'en se servant de notes plus nombreuses par le fractionnement des intervalles' and in his note on p. 64 n. 1 distinguishes polyphonie and polycordie, the division of sounds within the octave into smaller intervals, from panharmonie, the extension beyond a single octave. The sense of the verb—implying a widely scattered distribution—certainly favours the former interpretation. The best parallel I can find is in a literary analogy: Demetrius, Eloc. 13 (ἔοικε) τὰ δὲ (κῶλα) τῆς διαλελυμένης έρμηνείας διερριμμένοις πλησίον

λίθοις μόνον καὶ οὐ συγκειμένοις ('flung carelessly together'—Rhys Roberts).

- <sup>2</sup> There is a direct suggestion of moral looseness in its use in (e.g.) Xen. Cyr. 1. 6. 34, Plut. Mor. 266b, Arr. An. 2. 5. 4. Cf. Luc. Merc. Cond. 4, Alciphr. 1. 6. 2.
- <sup>3</sup> Compare the accusation against Timotheus:  $\pi$ αρανομεῖν εἰς τὴν μουσικήν (Plut. Mor. 795d; cf. 1144f).
- <sup>4</sup> For Seriphus as 'the back of beyond' see the passages quoted by Mayor on Juv. 10. 170. For Stratonicus' impatience with provincials, especially if they saw fit to argue on musical matters, see various anecdotes in Athen., e.g. 350c, 351a, 352a.
- <sup>5</sup> Not dissimilar is the use of κακοηθεύομαι in Sch. Ald. Ar. Nu. 969, with reference to the καμπαί of Phrynis.

Another charge regularly brought against musical innovation both vocal and instrumental was its artificiality and over-elaboration, which are described in a number of terms of a semi-technical nature. The frequent occurrence of  $\pi\epsilon\rho i\epsilon\rho\gamma$ -os, -ia, etc., may be observed first, for example in the explanation in Pollux 4. 65 of the derogatory use of the terms  $\Sigma\iota\phi\nu\iota\dot{\alpha}\zeta\epsilon\iota\nu$ ,  $X\iota\dot{\alpha}\zeta\epsilon\iota\nu$  in music:  $\tau\dot{\delta}$   $\mu\dot{\epsilon}\nu\tauo\iota$   $\Sigma\iota\phi\nu\iota\dot{\alpha}\zeta\epsilon\iota\nu$  καὶ  $X\iota\dot{\alpha}\zeta\epsilon\iota\nu$ ,  $\tau\dot{\delta}$   $\pi\epsilon\rho\iota\dot{\epsilon}\rho\gammao\iota$ s  $\mu\dot{\epsilon}\lambda\epsilon\sigma\iota$   $\chi\rho\eta\sigma\theta$ aι,  $\dot{\alpha}\pi\dot{\delta}$   $\Delta\eta\mu$ oκρίτου  $\tau o\hat{\nu}$   $X\iota$ ον καὶ  $\Phi\iota\lambda\dot{\delta}\varepsilon\nu\iota\dot{\delta}$ ον  $\tau\dot{\delta}$   $\Sigma\iota\dot{\phi}\nu\iota\dot{\delta}$ ον  $\tau\dot{\delta}$   $\varepsilon$  καὶ  $\Upsilon$ περτονίδης  $\varepsilon$  καλε $\varepsilon$ το. (There follows a note about Phrynis and his  $\mu\dot{\epsilon}\lambda\eta$   $\delta\nu\sigma\kappao\lambda\dot{\delta}\kappa\alpha\mu\pi\tau a$ .)

The Suda, s.v. Χιάζειν, has a similar note with the name Theoxenides for the Siphnian composer, quoting from Aristophanes (= fr. 912): Πραξιδάμας Δημόκριτον τὸν Χίον καὶ Θεοξενίδην τὸν Σίφνιον πρώτους ἐπὶ χρώματος τάξαι τὴν ἰδίαν ποίησιν, ὡς Ἰσοκράτης ἐν τοῖς πρὸς Εἰδοθέαν. ὡς παρὰ Ἀριστοφάνει κατατεταγμένου ὑποτείνει δέ τις αὐτῶν βωμολοχεῦσαι αὐτὸς δείξας ἐν ἀρμονίαις Χιάζων ἢ Σιφνιάζων. Ἰ (Note that Aristophanes uses βωμολοχεύω here just as he did in the celebrated criticism of the δυσκολόκαμπτοι καμπαί of Phrynis in  $\mathcal{N}u$ . 970–1.)

The reference to Aristophanes and the similarity to the passage from the Clouds places the use of this sort of terminology in the later fifth and early fourth centuries—the period of the hey-day of the 'new music' and the nickname Hypertonides given by his contemporaries to the Siphnian Philoxenides (or Theoxenides) presumably alludes to the extended compass of his music in contrast to the ancient  $\sigma \tau \epsilon \nu o \chi \omega \rho i a$  or  $\partial \lambda i \gamma o \chi o \rho \delta i a$ .

Other uses of  $\pi \epsilon \rho i \epsilon \rho \gamma \sigma s$  in musical contexts include:

Photius, s.v. λαρυγγίζειν· τὸ πλατύνειν τὴν φωνὴν καὶ μὴ κατὰ φύσιν φθέγγεσθαι ἀλλ' ἐπιτηδεύειν περιεργότερον τῷ λάρυγγι χρῆσθαι. (The same explanation is found in Harpocration and in Schol. Luc. Rhet. Pr. 19.)

Hsch. νίγλαροι· τερετίσματα, περίεργα κρούματα.

Plut. Mor. 1144 f τὸ σεμνὸν καὶ ἀπερίεργον τῆς ἀρχαίας μουσικῆς.

Dion. Hal. Isoc. 3 άρμόττει αὐτὰ (sc. ὀνόματα) περιέργως, τὴν εὐφωνίαν ἐντείνων μουσικήν.

Dio Chr. Or. 32. 62 (cf. 66) compares composers of licentious music (ἄσματα γυναικῶν καὶ κρούματα ὀρχηστῶν καὶ παροινίας τερετισμάτων)<sup>4</sup> to κακοὶ καὶ περίεργοι μάγειροι.

Clem. Alex. Paed. 1. 225. 3 περίεργοι ρυθμοί.

(Cf. also τὰ θαυμάσια καὶ περιττὰ τῶν ἔργων—the extraordinarily complex tours de force of professional kitharists which Aristotle deplores for educative purposes in Pol. 1341²11.)

In view of such passages  $\pi \epsilon \rho i \epsilon \rho \gamma \rho \nu$  is a possible emendation of the corrupt  $\pi \epsilon \rho i \sigma a \rho \gamma \rho \nu$  in a fragment of the  $K \iota \theta a \rho \omega \delta \delta s$  of Clearchus (fr. 2K ap. Athen. 623c):

1 As Democritus (nicknamed Bastas) whose music was referred to in the term Χιάζειν was also satirized for his vice (Luc. Pseudol. 3, cf. Eup. fr. 81) it is possible that the proverb Χιαστὶ τίλλειν (Hsch. ὡς τῶν Χίων κατεαγότων καὶ παρατιλλομένων; cf. Eust. 1462. 34) involves the same sort of musical joke as Cratinus' reference (fr. 256) to Gnesippus, the composer of erotic songs, ἔχων χορὸν λυδιστὶ τιλλουσῶν μέλη πονηρά. Hence doubtless also the variant χιανεύει καὶ λαικάζει for χοανεύει in the Suda's quotation from Ar. Thesm. 57, where the

effeminate compositions of Agathon are being described.

- <sup>2</sup> Cf. the extensions to the compass of the kithara regularly attributed to Timotheus, whose  $\dot{\nu}\pi\epsilon\rho\beta$ ολαίουs ἀνοσίους καὶ νιγλάρους are satirized by Pherecrates in the *Cheiron* (fr. 145, 27).
- <sup>3</sup> For further examples of these terms used of diction (e.g. Thucydides' style), see Ernesti, Lex. Tech. Gr. Rhet., s.v. περίεργον.
- 4 Cf. Luc. Nigr. 15 κρουμάτων τε καὶ τερετισμάτων καὶ διεφθορότων ἀσμάτων.

γόγγρων τε λευκών πᾶσι τοῖς κολλώδεσι βρόχθιζε. τούτοις γὰρ τρέφεται τὸ πνεῦμα καὶ τὸ φωνάριον ἡμῶν περίσαργον γίνεται.

Neither Casaubon's περίλαμπρον (not attested) not Kaibel's περίτρανον has much transcriptional plausibility, and although Schweighäuser's περίσαρκον ('full-fleshed') has been widely accepted, it not only assumes a unique metaphorical meaning for a rare word, but does not suggest the refinement of voice on which the speaker appears to be congratulating himself—indeed it would be the equivalent of praepinguis which Quintilian includes among adjectives denoting defects of the voice (11.3.32). Ύπέρογκος (Poll. 2.116) of the voice is also probably pejorative. The kitharode recommends 'gargling the throat' with juicy conger-eels to nourish the breath (eels are πολύτροφοι according to Athen. 298b) and to make the voice more supple for the καμπαί, τερετίσματα, etc., of the contemporary style. It may be observed that the only earlier citation of the diminutive φωνάριον³ is Ar. fr. 644 φωνάριον ψδικὸν καὶ καμπτικόν—probably a reference to the elegant preciosity of some contemporary kitharode.

The reference to a diet of eels clarifies the point of a passage in Plutarch (Mor. 349 a) which does not seem to have been noticed. Discussing the Athenian expenditure on war and peace he quotes a Spartan who contrasted the meagre rations of their armies in the field with the care and money lavished on tragic productions:

οί δὲ χορηγοὶ τοῖς χορευταῖς ἐγχέλεια καὶ θριδάκια καὶ σκελίδας καὶ μυελὸν παρατίθεντες, εὐώχουν ἐπὶ πολὺ χρόνον φωνασκουμένους καὶ τρυφῶντας.

The inclusion of  $\epsilon \gamma \chi \epsilon \lambda \epsilon \iota a$  in the singers' diet is for their beneficial effect on the throat, as the verb  $\phi \omega \nu a \sigma \kappa o \nu \mu \epsilon \nu o \nu s$  shows, and is quite separate from any allegation of  $\gamma a \sigma \tau \rho \iota \mu a \rho \gamma \iota a$  on the part of Athenian choreutae.<sup>4</sup> The same point may well be alluded to in Ar. Ach. 885–6 where Dicaeopolis hearing that the Boeotian has, as the most tempting of his foodstuffs for sale, eels from lake Copais, cries out

ῶ φιλτάτη σὺ καὶ πάλαι ποθουμένη, ἦλθες ποθεινὴ μὲν τρυγῳδικοῖς χοροῖς, φίλη δὲ Μορύχῳ.

The commentators take this to refer to 'the triumphal banquet to which the

<sup>1</sup> Perhaps the nearest equivalent is  $\sigma \alpha \rho$ - $\kappa \omega \delta \dot{\eta} s$  of a 'full-bodied' wine in Athen. 27 c.

<sup>2</sup> Pinguis itself is cited of the male voice by Isid. Etym. 3. 20. 12.

<sup>3</sup> Cited elsewhere only from Philodemus (A.P. 5. 131), where (although there is an unsolved textual problem) it is used of a woman's coy or amorous cries. [Arist.] Aud.  $803^{b}24$  has  $\phi\omega\nu i \nu$  of a light voice  $\delta\tau a\nu$   $\delta\lambda i \nu \nu \delta i \tau \delta \tau \nu \epsilon \hat{\nu} \mu a$ , which lends some support to Schweighäuser's view of the Clearchus fragment. See below, p. 155, on vocula.

<sup>4</sup> As Pickard-Cambridge's citation of the passage (*Dramatic Festivals of Athens*, p. 77) implies. I do not mean to say that there was not a joke about the gluttony of choreutae, as was apparently implied in the use of  $\phi a \rho \nu \gamma - (\gamma) \ell \nu \delta \eta \nu$  by some comic poet (Com. Adesp. 1185k from Phot., Et. Mag., s.v.  $\phi a \rho \nu \gamma \ell \nu \delta \eta \nu$ 

ώς αριστίνδην σκώπτοντες γαρ την γαστριμαργίαν τῶν χορευτῶν Αττικοὶ οὕτω λέγουσι). I take it that the joke turns on a double perversion of ἀριστίνδην or πλουτίνδην: the chorus was selected pharynx-wise, not because of their excellent voices, but their capacity for swallowing. Cf. λαρυγγικός of a glutton in Pher. fr. 32K. (The joke seems to have been too much for L.S.J., who give 'φαρυγίνδην, like a gulf'. As I hesitate to emend to 'gulp' I presume they have confused φάρυγξ and φάραγξ. But the word has been a source of trouble to earlier lexicographers. It appears in the Suda in the form φαλαγγίνδην out of alphabetical order—or it used to appear there, for it has disappeared apparently without trace in Adler's edition. It survives hazardously in Hsch. in the form φαρυγγίδα ἀντὶ τοῦ γαστριμαργίαν.)

Chorus would presently be invited by the Choregus' (Rogers ad loc.), but the Ravennas scholiast has the correct explanation— $\vec{\epsilon}\sigma\iota\tau\sigma\hat{v}\nu\tau\sigma$   $\gamma\hat{a}\rho$  of  $\chi\sigma\rho\epsilon\nu\tau\alpha\hat{a}$   $\delta\eta\mu\sigma\sigma\hat{a}$ , where the word  $\delta\eta\mu\sigma\sigma\hat{a}$  shows that he was thinking rather of the general expenditure on the training of the chorus.

It may be that the other foodstuffs mentioned are included for the same reason.  $\theta\rho\iota\delta\alpha\kappa\iota\nu\eta$  was anciently noted as an anaphrodisiac—see the passages quoted in Athen. 69 ff.; Pliny N.H. 19. 127, 20. 64; Gp. 12. 13<sup>2</sup>—and as such would be considered beneficial for singers, who should be abstemious, according to both Greek and Roman tradition—see Pliny N.H. 20. 28, referring to Democritus, Plut. Mor. 737b, Quint. 11. 3. 19, Juv. 6. 73 ff. and other passages on the use by actors and singers of the fibula, ut a coitu, ne raucescerent, prohiberentur (schol. on Juv. loc. cit.).  $\sigma\kappa\epsilon\lambda\iota$ s here is a head or clove of garlic—not roast-beef  $(\sigma\chi\epsilon\lambda\iota s)^4$  as it is often taken, e.g. by Neil on Ar. Eq. 362 and the Loeb translator of the Moralia, or ham (Krumbacher, Die Stimmbildung der Redner im altertum, p. 104)—and garlic is mentioned for its soothing effect on the voice in Arist. Pr. 11. 39 and Pliny N.H. 20. 53-54.5 I can cite no evidence for  $\mu\nu\epsilon\lambda\delta\nu$ 6 which is mysteriously translated as cheese by Haigh, Attic Theatre³, p. 61.

A number of other green vegetables or aromatic plants were considered beneficial to the voice, notably leeks (Arist. Pr. 11. 39, because of their  $\gamma\lambda\iota$ - $\sigma\chi\rho\delta\tau\eta_s$ —cf.  $\kappao\lambda\lambda\delta\delta\eta_s$  in the Clearchus fragment; Pliny N.H. 20, 47–49; id. 19. 108, where he records Nero's use of sectivum porrum vocis gratia), chalbane, the juice of panaces, useful  $\pi\rho\delta_s$   $\tau\delta_s$   $\phi\omega\nu\alpha\sigma\kappa i\alpha_s$  (Theoph. H.P. 9. 9. 2), tragacanth (Synesius, Dio 1148 c Migne = p. 38. 30 Treu—eaten by the ambitious public speaker  $i\nu\alpha$   $\tau o\rho\delta\nu$   $\tau\epsilon$   $\kappa\alpha i$   $\epsilon i\eta\chi\epsilon s$   $\phi\theta\epsilon\gamma\xi\eta\tau\alpha i$ ), and many others mostly mentioned by Pliny and collected by Krumbacher—quite apart from unspecified liquid concoctions of the type which caused the unfortunate choreutes' death in Antiphon's speech, or the liquidum plasma of Persius, Sat. 1. 17, if indeed the word has a literal and not metaphorical sense there.

To such a list might be added κραμβή, since, according to Gp. 12. 17. 13 ϵψηθϵῖσα δϵ, καὶ καθ' ϵαυτὴν προϵσθιομένη, φωνὴν καὶ τὰς ἀρτηριακὰς διαθέσεις θϵραπϵύϵι . . . ὅθϵν καὶ οἱ φωνασκοὶ ταύτῃ κϵχρηνται. 12 It is tempting to link this last belief with the obscure ἀπὸ κραμβοτάτου στόματος of Ar. <math>Eq. 539: the adjective κράμβος otherwise exists only in the glosses of the lexicographers and the wild etymology of the scholiasts. (For discussion of the possibilities see R.E.G. xix [1906], 299 ff., 383 ff., ibid. xx [1907], 164 ff.) Earlier in Eq. (353 ff.) there

- r So, in connexion with dithyrambic poets and performers, the allusion in Nu. 338–9, with schol. When Merry in his edition translates κεστρᾶν τεμάχη μεγαλᾶν ἀγαθᾶν as 'slices of fine big conger', I can only assume that he had such a passage as Plut. Mor. 349 a in mind, as the κεστρᾶ is not a conger-eel.
  - <sup>2</sup> Cf. also Ael. V.H. 12. 18.
- <sup>3</sup> Cf. Plin. N.H. 34. 166-7 on Nero's experiments.
- 4 Cf. Alex. Trall. 8, 2 (Puschmann ii. 351) σκόρδων σκελίδας τριβείσας καὶ λειωθείσας, and schol. Nic. Alex. 432, ἄγλιθες οἱ κόκκοι, ἐξ ὧν αἰ κεφαλαὶ τῶν σκορόδων σύγκεινται, ἄπερ σκελίδια ἡ συνήθειά φησιν.
- 5 Cf. Diosc. Ευρ. 1. 87 λαμπρύνει την φωνήν.
  - 6 It is included in a list of foodstuffs in

- Pherecr. fr. 148. 3—from the *Cheiron* in which musical matters were prominent, and the list includes also  $a\mu\nu\gamma\delta a\lambda a\iota$  which are mentioned among remedies for the voice in Gal. 13. 8, Cael. Aur. de Morb. p. 379 Amman.
- <sup>7</sup> Cf. Isid. De Eccl. Off. 2. 12 antiqui pridie quam cantandum erat, cibis abstinebant, psallentes tamen legumine in causa vocis assidue utebantur. unde et cantores apud gentiles fabarii dicti sunt. Pliny (N.H. 22. 141) quotes Varro as saying that beans voci prodesse. Cf. Gal. 13. 12.
- <sup>8</sup> Cf. Ser. Sam. *Med.* 15. 271 (who gives various remedies for the vocal organs).
  - <sup>9</sup> Loc. cit., pp. 102-4.
- 10 Cf. εὐφωνίας χάριν ἔπιε φάρμακον (Argument, Or. 6).
- <sup>11</sup> See below, p. 155.
- 12 Cf. Gal. 13. 12, Diosc. Eup. 1. 85.

is an exaggerated parody of the use of different foods in order to succeed in demagogic oratory, which suggests that it was a topic of contemporary interest and suitable material for jests.

Krumbacher also refers to substances considered injurious to the voice, but apparently omits the artichoke, which raises an interesting problem. If it was an aphrodisiac<sup>1</sup> it would be open to objections on the grounds stated above, but apart from this, an epigram of Juba II of Mauretania quoted by Athenaeus (343 f), and a couplet about the *cinara* in Columella (*R.R.* 10. 235–6) should be considered together. Juba's epigram concerns an Argive tragedian Leonteus in respect of a performance  $\delta \tau \epsilon \kappa \alpha \kappa \hat{\omega}_S \tau \hat{\eta} \nu \Upsilon \psi \pi \nu \delta \eta \nu \psi \pi \epsilon \kappa \rho i \nu \alpha \tau \sigma$ .

μή με Λεοντῆος τραγικοῦ κιναρηφάγον ἦχος λεύσσων Ύψιπύλης ἐς κακὸν ἦτορ ὅρα. ἤμην γάρ ποτ' ἐγὼ Βάκχῳ φίλος, οὐδέ τιν' ὧδε γῆρυν χρυσολόβοις οὔασιν ἦγάσατο. νῦν δέ με χυτρόποδες, κέραμοι καὶ ξηρὰ τάγηνα χήρωσαν φωνῆς, γαστρὶ χαριζόμενον.

Although the vocal deterioration of Leonteus the  $\partial \psi o \phi \acute{a} \gamma o s$ , is attributed in the last couplet to his addiction to fried fish,² there must be some point in calling his voice (or himself³)  $\kappa \iota \nu a \rho \eta \phi \acute{a} \gamma o s$ , and the explanation is found in Columella's allusion (R.R. 10. 235–6):

hispida ponatur cinara, quae dulcis Iaccho potanti veniat, nec Phoebo grata canenti.

The artichoke, which stimulates the enjoyment of wine, is injurious to the voice of even Phoebus himself.<sup>4</sup> The tradition that the artichoke was bad for a tragic actor's voice may be traced back to the fifth century, and to Hegelochus whose celebrated *lapsus linguae* in line 279 of Euripides' *Orestes* was the subject of jests in the comic poets, including Strattis (fr. 1, quoted by Schol. Eur. ad loc.):

καὶ τῶν μὲν ἄλλων οὐκ ἐμέλησέ μοι μελῶν, Εὐριπίδου δὲ δρᾶμα δεξιώτατον διέκναισ' 'Ορέστην, 'Ηγέλοχον τὸν Κιννάρου (?) μισθωσάμενος τὰ πρῶτα τῶν ἐπῶν λέγειν.

Κυντάρου or Κινυάρου MSS.: Κιννάρου Bentley: Κυννάρου Dindorf.

- <sup>1</sup> Asserted by Pliny (N.H. 22. 86); denied by Page (Sappho and Alcaeus, p. 305, where the ref. to Powell's article should be C.Q. xx).
- <sup>2</sup> An earlier tragedian Melanthius whose πικροτάτην ὅπα γηρύσαντος Aristophanes recalls in the *Peace* (805) is in the same passage described along with his brother as Γόργονες ὀψοφάγοι, βατιδοσκόποι . . . ἰχθυολῦμαι.
- <sup>3</sup> Schweighäuser's emendation κιναρη-φάγου, however, seems unnecessary if  $\hat{\eta}\chi os$  is retained (he emended also to  $\hat{\eta}\theta os$ ). Although one would expect  $\hat{\eta}\chi ov$ , the neuter is occasionally found in later Greek (see L.S. J., also Ps. Call. p. 61. 2, 9; P. Mag. 13. 201, 204, 394, 545; Jo. Mal. p. 121. 12, 436. 20;  $\hat{\eta}\chi ovs$ ,  $\hat{\eta}\chi o\hat{v}s$  are variants in the text of Philo I. 171. 20, 4. 20. 5, Clem. Alex. Strom. 5. 1. 33).
- <sup>4</sup> Leonteus' experience was the opposite of that recorded of another tragedian

Hegesianax by Demetrius of Scepsis ap. Athen. 80 d, whose fine voice was attributed to his eighteen years' abstention from figs. This belief is repeated by Pliny (N.H. 23. 120 fici maturae . . voci contrariae intelliguntur), who however adds (121) that when dry they are gutturi et faucibus magnifice utiles. Those interested in the foregoing details of vocal dietetics may like to consult a list of the foods and drinks considered by Viennese operatic celebrities of the 1860s to be beneficial before or during their performances, which vary from the two salted cucumbers of the tenor Labatt to Mlle Braun-Brini and her glass of beer after the first act and bottle of Moët Crêmant Rosé before the duet in the fourth act of Les Huguenots (quoted by Gordon Holmes, Vocal Physiology and Hygiene, pp. 212-13).

The name of his father is not otherwise known, but as he was notoriously  $d\tau \epsilon \rho \pi \eta s$  (or  $d\eta \delta \eta s$ )  $\tau \eta \nu \phi \omega \nu \eta \nu$  (Schol. Ar. Ran. 303, referring to Plato Comicus fr. 215), it is remarkable that Strattis here calls him something which looks like 'son of artichoke', and I suspect that this is another example of the use of a 'comic patronymic' to which Professor Dover has recently referred.

To resume after this digression, artificiality of note production both in singing and in instrumental playing is described also in a number of terms derived from  $\pi\lambda\dot{\alpha}\sigma\sigma\omega$  where precision of meaning is often difficult to determine. The most notable passage occurs in the distinction drawn by Theophrastus<sup>2</sup> (H.P. 4. 11. 4) between two styles of playing the aulos, where it is said that until the time of the famous fourth-century Theban aulete Antigenidas, players played ἀπλάστως, but thereafter είς τὴν πλάσιν μετέβησαν and played μετὰ πλάσματος. Theophrastus does not elucidate the expressions more precisely, and we may assume that he uses familiar musical terms, but he asserts that a different quality of reed is required for the different playing styles. It is at first sight tempting to refer the 'artificial' style to the use of the upper harmonics of the instrument obtainable by overblowing, as opposed to a restriction to the notes of the simple scale available according to the number and position of the finger-notes, the compass not being extended by over-blowing<sup>3</sup>—hence the traditional 'polychordia' of the aulos and the view that the extension of the compass of stringed instruments was an 'imitation' of the aulos.4 (A possible explanation of Lysander of Sicyon's innovation of ἔναυλος κιθάρισις in Athen. 637 f, quoting Philochorus, is that it refers to the use of the upper partials of stopped strings.5)

It seems improbable, however, that the potentialities of overblowing the aulos were not discovered before Antigenidas, and certainly its  $\pi o \lambda v \chi o \rho \delta i a$  is a notion which goes back well before his era. I conclude therefore that the

- 1 Maia xv (1963), 10 f., BICS xi (1964), 36. Of course κινάρα has  $\tilde{\iota}$ , but a comic pun might pervert this, especially if his father's real name happened to resemble the word, or if there was such a name as Kinnaros, which was once regarded as attested in the proverb cited by Zenob. (1. 31) ἀρπαγὰ τὰ Κιννάρου (cf. Hsch. s.v.). But the Diegesis ix. 12 of Callim. corrects this to τὰ Κοννίδα in explaining the proverb, and otherwise neither Kinnaros nor Kuntaros seems to occur.
- <sup>2</sup> Copied by Pliny, N.H. 16. 170-2, whose version does not, however, clarify matters.
- <sup>3</sup> I disagree with Lasserre (Plutarque, De la Musique, p. 166) who thinks that the  $\pi\lambda \acute{a}\sigma\mu a\tau a$  of Antigenidas consisted precisely in limiting his range to the natural octave, obturant le trou de la syrinx (see p. 16 n. 1). If  $\~a\pi\lambda a\sigma \tau os$ , etc., refer to pitch I cannot think that the basic scale would be called 'artificial' and the overblown notes 'natural', but vice versa. That this is the natural interpretation is confirmed by the language of Plut. Mor. 853e, where Menander's lowering of the emotional tension after a flamboyant passage

- is compared to an aulos player who has first opened all the finger-holes, then, closing them, κατέστησε τὴν φωνὴν εἰς τὸ οἰκεῖον.
- 4 The aulos πολύχορδος acc. to an early lyricist (Stesichorus?) Fr. Adesp. 947 b Page; πάμφωνος Pind. Ol. 7. 12, Isth. 4. 27, Pyth. 12. 19; its πολυφωνία Plut. Mor. 1141 c, πολυχορδία 713 a; imitation of aulos technique on other instruments because πολυχορδότατος Plat. Rep. 399 d, cf. Leg. 700 d αὐλωδίας δὴ ταῖς κιθαρωδίαις μιμουμένοι.
- <sup>5</sup> So τὸν καλούμενον συριγμόν in the same passage. Cf. Düring on Eupolis, fr. 110, Eranos xliii (1945), 196. On the stopping of strings in general, see Winnington-Ingram, C.Q. N.S. Vi (1956), 169 ff.
- 6 Apart from pre-fourth-century passages quoted above, see in particular the innovations ascribed to Pronomus of Thebes (Athen. 631e, Paus. 9. 12. 5). Such an instrument as the one (early fifth century?) found at Brauron (see Landels, B.S.A. lviii [1963], 116–19) would hardly be called πολύχορδος if limited to its natural notes. The evidence for introduction of the syrinx which, with Howard (H.S.C.P. iv [1893], 32–35) I

innovation ascribed to him must refer to an artificial style of playing; and as Theophrastus makes a special point of the  $\kappa \alpha \tau \alpha \sigma \pi \acute{\alpha} \sigma \mu \alpha \tau \alpha$  of the reeds cut and shaped for playing  $\mu \epsilon \tau \grave{\alpha}$   $\pi \lambda \acute{\alpha} \sigma \mu \alpha \tau \sigma$ , the style adopted by Antigenidas and his school may have featured an artistically cultivated vibrato unlike the more strident 'straight' playing of earlier aulos playing.¹ We know well today that there is nothing which divides wind players (especially in the case of reed instruments) into opposite camps more than the adoption or avoidance of vibrato. A comparable use of terminology is Plutarch's combination of  $\sigma \kappa \lambda \eta \rho \acute{\alpha}$ ,  $\mathring{\alpha} \pi \lambda \alpha \sigma \tau \sigma \sigma$  of the voice in Cic. 3.

Quintilian's reference (1. 11. 6) to καταπεπλασμένος as a term of Greek aulos playing—if this is the same as Theophrastus' πλάσις, πλάσμα—precludes any reference to harmonics:

... nec verba in faucibus (magister) patietur audiri nec oris inanitate resonare, nec, quod minime sermoni puro conveniat, simplicem vocis naturam pleniore quodam sono circumliniri, quod Graeci καταπεπλασμένον dicunt. Sic appellatur cantus tibiarum, quae praeclusis quibus clarescunt foraminibus, recto modo exitu graviorem spiritum reddunt.

Here the 'plastic' style is associated with the *lower* notes obtained by closing the finger holes,<sup>2</sup> and although *claresco* is ambiguous, as it could refer to quality of sound no less than pitch,<sup>3</sup> Butler's translation in the Loeb edition 'which produce the treble notes' is justified, for at 11. 3. 41 Quintilian equates the

take to be the equivalent of the speaker-key of the modern clarinet, and would certainly facilitate the production of harmonics, is that it belonged to the period of the Megarian aulete Telephanes, contemporary of Demosthenes, who was averse to its use (Plut. Mor. 1138a), in the way that instrumentalists of a later age have opposed the Boehm flute or the valve-horn.

<sup>1</sup> Reinach in Daremberg-Saglio v, p. 318, takes it to be a tremolo ('une manière particulière "d'envelopper" le son); M. Dinse (De Antigenida Thebano Musico, p. 53) writes 'ein manierirtes, modulirtes Spiel, ut nostrates dicunt'. It is unfortunate that a clue to the nature of the earlier  $\tilde{a}\pi\lambda a\sigma\tau os$  style involves an unsolved textual problem in Theophrastus -συμμύειν δὲ τὸ στόμα τῶν γλωττῶν, ὁ πρὸς την διακτηρίαν (UMV: διακτορίαν Ald.) είναι χρήσιμον. For attempts to justify the corrupt word see Dinse, op. cit. 50-52. Stephanus conjectured διατορίαν, which would be entirely convincing if the word existed elsewhere. The adj. διάτορος is used of the clear, piercing sound of the trumpet in Aesch. Eum. 567 (where it is to be noted that F Tri present διάκτορος, the same corruption) and τόρος similarly in Philostr. V.S. 1. 25 (ii. 52. 24); of the crow of a cock in Luc. Gall. 1, Ael. V.H. 2. 44 (cf. Alciphr. 3. 48. 1); Dio Chr. 2. 56-57 uses it of virile music as opposed to κατεαγότα μέλη ἀμούσοις καμπαίς καὶ πολυφώνων ὀργάνων ποικιλίας;

Ael. N.A. 6. 19 contrasts ὅρθια καὶ διάτορα with γοερὰ καὶ θηλύφωνα. Pliny seems to have had something quite unlike this in his text, however, as he gives quod erat illis theatrorum moribus utilius. Acc. to [Arist.] Aud. 801<sup>b</sup>37 a harsh, clear sound is produced by aulos reeds which are συγκροτωτέραις or συγκροτητικαῖς (Prantl and Düring respectively for the corrupt συγκροτέραις), i.e. firm, compact.

<sup>2</sup> Mention might be made here of Hesychius' παραπλασμός· ὁ ἐν ταῖς τῶν αὐλῶν τρύπαις ῥύπος. It is impossible to determine if the wax referred to would be used to adjust intonation which was faulty through incorrect placing of the finger holes, or was a device to block, wholly or partially, certain finger holes for the performance of a work involving a particular scale or mode. I am not much enamoured of Garrod's emendation (C.R. xxxiv [1920], 135) ῥυπαροτρυπάνως δέμας πεπλασμένον in l. 13 of the celebrated Pratinas fragment (708 Page). (The use of πεπλασμένον here is a strange, but apparently irrelevant, coincidence.)

3 Just as in terms like λευκός, μέλας used of the voice, the connotations of clarity and pitch are not readily separable, although Aristotle (Top. 107° 13 ff.; cf. S.E. M. 6. 41) defines the 'white' voice as εὐήκοος and distinguishes it from ὀξύς. Candida and fusca of the voice are opposed in Quint. 11. 3. 15, Plin. N.H. 28. 58. Modern Italian uses voce bianca of the treble voice.

gravissimus sonus with one which is parum clarus nimiumque plenus, the latter being the pleniore sono also of 1. 11. 6.

The καταπεπλασμένος quality of sound which Quintilian relates to the lower notes of the aulos has its equivalent use in certain types of artificial and affected delivery of the human voice. Quintilian himself calls this κοιλοστομία (1. 5. 32), cum vox quasi in recessu oris auditur, and Philodemus (Rhet. 1. 200 S.) brings the two terms together apropos of a certain manner of speaking for a special effect: ὅταν δ' ἦθος ἐμφαίνειν θέλωσι, (sc. ὁρῶμεν) κοιλοφώνως καὶ πεπλασμένως λαρυγγίζοντας. Hesychius glosses ληκυθιστής as κοιλόφωνος and Pollux (4. 114) includes among words used of affected actors βαρύστονος,² βομβῶν, περιβομβῶν, ληκυθίζων, λαρυγγίζων, φαρυγγίζων. This hollow-voiced style is specifically related to voice-training in Phrynichus (Praep. Soph. p. 86, 9 Borries): ληκυθίζειν ὁπόταν βούλωνται οἱ φωνασκοῦντες κοῖλον τὸ φθέγμα ποιεῖν, ὥσπερ εἰς ληκύθους προιέμενοι,³ and the many passages in which the βόμβος of the aulos is mentioned show that its most characteristic and memorable sound was in its lower register. Plutarch (Mor. 713a) warns against its stimulating effect when played βόμβυξι καὶ πολυχορδίαις. \*

The description of Nero's voice in the essay ascribed to Lucian<sup>5</sup> states φθέγγεται δε κοίλον μεν φύσει καὶ βαρύ, έγκειμένης αὐτῷ τῆς φάρυγγος μέλη δ' οὖτω κατεσκευασμένης βομβε $\hat{\imath}$  πως. I can make nothing of εγκειμένης here, which should probably be ἐγκεκλειμένης, referring to the constriction of the pharynx which produces the hollow  $\beta \delta \mu \beta \sigma s$  similar to the sound of the aulos with the finger holes closed. Such a condition when not used for some artistic purpose could be a defect, and the use of κατίλλειν of the voice in Hp. Epid. 3. 5φωναὶ κακούμεναι καὶ κατίλλουσαι (κατειλοῦσαι)—discussed at length by Galen 17 (1). 678 and Littré, vol. 3, pp. 76-80, probably refers to a distorted or constricted condition of the throat. The gloss in Photius on κατουλάδα νύκτα· τὴν κατίλλουσαν καὶ κατείργουσαν<sup>6</sup> is an explanation which goes back to the Atticist Pausanias (225). Other  $\epsilon i \lambda \dot{\epsilon} \omega$  compounds are used in similar meanings, e.g. [Arist.] aud. 804<sup>2</sup>20 the voice of a person with a sore throat, thickened through roughness of the windpipe, προκόπτουσαν ἀνειλεῖσθαι ('is pent up') καὶ λαμβάνειν ὄγκον. In Arist. Quint. p. 78. 11 W.-I., the articulation of the letter omikron is described as τό τε φωνητικον συνίλλον ὄργανον καὶ τον φθόγγον πρίν εκφωνηθηναι συνάρπαζον.<sup>7</sup>

It is possible that it was to this veiled and constricted type of voice that

- 1 A distinction of speaking πεπλασμένως or πεφυκότως goes back to Arist. Rhet. 3. 2. 4.
  2 Used of ranting actors in Dem. 18. 262, Philostr. V.S. 1. 18. 1.
- 3 In the Suda's entry (s.v. ληκυθισμός), περιενεγκεῖν εὐστρόφως καὶ κεκλασμένως τὸν ληκυθισμὸν τῶν αἰσχρῶν καὶ γελοίων ἀσμάτων. τουτέστι τὴν εὐφωνίαν, the verb περιενεγκεῖν does not seem to make much sense. The nearest parallel I have found is Eunapius fr. 54 (F.H.G. iv, p. 38) . . . εἶτα ἐπήγαγεν ἀρμονίαν σύντονον, ἐπὶ ταύτη δὲ πάλιν εἰς τὴν γλυκεῖαν περιήνεγκεν; but here the notion involves the shifting or 'bringing round' of the harmonia from one type to another. The verb in the Suda should probably be προενεγκεῖν. Cf. id. s.v. βωμολοχεύσαιτο . . . . οἰονεὶ κεκλα-
- σμένη τῆ φωνῆ τὴν ὦδὴν προενέγκοιτο (Schol. Ar. Nu. 969 has προσενέγκοιτο here, the Aldine schol. ἀνενέγκοιτο).
- 4 Poll. 4. 82 τὸ δὲ τῶν βομβύκων ἔνθεον καὶ μανικὸν τὸ αὔλημα, πρέπον ὀργίοις. For βόμβυξ as the lowest note on aulos, see Arist. Met.  $1093^{b}3$ .
- 5 Nero 6. His voice was βραχὺ καὶ μέλαν
   (D.C. 62. 20), exigua et fusca (Suet. Nero 20);
   cf. Philostr. V.A. 4. 44, 5. 7.
- 6 Similarly Plut. (Mor. 510 e οδλα καὶ πυκνὰ καὶ συνεστραμμένα φθεγγομένους) seems to have taken οδλος to mean concise, contracted. But see below, p. 156, n. 5.
- <sup>7</sup> Cf. the derivation of  $\tilde{\epsilon}\lambda\lambda o\pi\epsilon s$  ( $\tilde{\epsilon}\lambda\lambda o\pi\epsilon s$ ) in Athen. 308 c διὰ τὸ εἴργεσθαι φωνῆs. (Also Plut. Mor. 728 e.)

the phonasci gave the strange name δενδρυάζουσα—a fact recorded in a passage which seems to have gone almost unnoticed—in Aelius Dionysius fr. 119, quoted by Eust. 396. 29: δ δὲ ρηθεὶς Διονύσιός φησιν ὅτι καὶ φωνήν τινα καλοῦσιν οἱ φωνασκοὶ δενδρυάζουσαν. The verb is otherwise glossed τὸ δρυσὶ σκέπεσθαι καὶ τὸ καθ' ὕδατος δύεσθαι. 1

Sharing the notion of vocal affectation, but not with the special sense of hollowness inherent in  $\lambda\eta\kappa\nu\theta\iota\sigma\mu\delta$ s, etc., are a number of other passages where effeminacy is especially hinted at, notably Persius Sat. 1. 17–21 where the titillating effect—even on virile Romans—of a song is described: liquido cum plasmate guttur | mobile collueris, patranti fractus ocello, etc. The scholiast believes plasma here to be an actual liquid for gargling, and may be right, but the word could refer to a delicate and supple modulation of the voice, as in Clem. Alex. Paed. 3. 11. 68  $\phi\omega\nu\alpha\hat{i}s$   $\tau\alpha\hat{i}s$   $\pi\epsilon\pi\lambda\alpha\sigma\mu\epsilon\nu\alpha s$   $\kappa\lambda\alpha\delta\alpha\rho\delta\nu$   $\pi\epsilon\rho\iota\beta\lambda\epsilon\nu\alpha\sigma\alpha s$  (said of prostitutes). At any rate the assumption by the voice of a vibrant quality is shown by the conclusion of the passage, et tremulo scalpuntur ubi intima versu. This passage has been well compared to Quint. 1. 8. 2, sit autem in primis lectio virilis... non tamen in canticum dissoluta nec plasmate (ut nunc a plerisque fit) effeminata.

Less easy to interpret is the meaning of falsae voculae in Cic. De Or. 3. 98.4 Writing of how one is first charmed, then soon sated, by artistic novelties, he continues: quanto molliores sunt et delicatiores in cantu flexiones et falsae voculae quam certae et severae! quibus tamen non modo austeri, sed, si saepius funt, multitudo ipsa reclamat. Wilkins in his note takes this to refer to 'falsetto notes' and although he admits to knowing no evidence for his conjecture, some slight support might be elicited from Quintilian (11. 3. 41) who, commenting on the unsuitability of both the gravissimus and acutissimus sounds of music for the orator, says of the latter that it is ultra verum. (Butler translates cautiously 'an impression of extravagance'.) But although he is right to compare Cicero's flexiones with the  $\kappa a \mu \pi a'$  of Ar. Nu. 970,5 I prefer to take the falsae voculae as referring to some type of tremolo or vibrato, an affected effeminacy which contrasts with the certae et severae notes of the 'classical' style; and falsus will have the same implications as  $\pi \lambda a \sigma \tau \acute{o}s^6$  in the passages already discussed. Wilkins also misses

- <sup>I</sup> ὑποδενδρυάζειν, δρύεται, δρυάζειν, etc. (the last glossed  $\phi$ λυαρεῖν by Hsch.). I know of no discussion of the musical meaning of the word, which is not referred to in L.S.J., who fail to record also another strange term of the phonasci, the διάτραμις  $\phi$ ωνή (see Hsch.).
- <sup>2</sup> Cf. Ernesti, Lex. Tech. Lat. Rhet., pp. 286–9, s.v. plasma; id., Lex. Tech. Graec. Rhet., pp. 268–70, s.v. πλάσμα, for the general usage of this word.
- <sup>3</sup> For a similar metaphor, with the same sexual implications, cf. Ar. Nu. 979 μαλακήν φυρασάμενος τὴν φωνὴν πρὸς τὴν ἐραστήν, κτλ.
- <sup>4</sup> I am indebted to Professor E. Laughton for drawing my attention to this passage.
- <sup>5</sup> While the certae et severae notes correspond to ἐντειναμένους τὴν ἀρμονίαν of line 969. On the 'formless flexibility' and 'tonal instability' which characterized the 'new music' of the fifth century B.C., see Mrs. I. Henderson's comments in The New Oxford History of Music,
- i. 393 ff. I might mention here the view of M. Kokolakis (Lucian and the Tragic Performances in his Time [1960], p. 90) that Luc. De Salt. 27 ἐαυτὸν ἀνακλῶν καὶ κατακλῶν means 'in a tremolo voice, now high, now low'. But although κλάω and its compounds are frequently used of effeminate modulations and the like, I find such a meaning improbable here in view of the reflexive object, and the fact that Lucian himself (or his imitator) uses κατακλώμενος (De Salt. 5) and ἀνακλώμενος (Nero 7) of bodily contortions.
- <sup>6</sup> It is fair to add that Contopoulos gives  $\pi \lambda \alpha \sigma \tau \dot{\eta}$  δξυφωνία as the modern Greek term for falsetto, but that treble notes are meant over and above artificiality of their production is signified by the prefix δξυ-. The use of vocularum falsarum soni to translate falsetto in the treatise of Lehfeldt (1835) Nonnulla de vocis formatione, p. 64, is doubtless based on the Ciceronian expression.

the striking fact that the same Antigenidas who cultivated the  $\pi\epsilon\pi\lambda a\sigma\mu\acute{e}\nu\sigma$ s style of aulos playing which I have also interpreted as referring to vibrato, is described by Apuleius (Flor. 4. 1) as omnis voculae melleus modulator et idem omnimodis peritus modificator. The diminutive is used to suggest a feminine delicacy of sound, just as Clearchus in the fragment of the Kitharodos, cited previously, uses  $\phi\omega\nu\acute{a}\rho\iota o\nu$   $\pi\epsilon\rho\acute{\epsilon}\rho\gamma o\nu$ (?). The falsity or artificiality referred to in such terms, to which one might add from Hesychius  $\tau\epsilon\rho\epsilon\tau\acute{\iota}\sigma\mu\alpha\tau\alpha$   $\dot{\omega}\delta\alpha i$   $\dot{a}\pi\alpha\tau\eta\lambda ai$ , is a defect of style (in the eyes of its critics), however exquisite the conceits might appear to the performers and their admirers. That they are not confined to a precise vocal range is shown by the fact that both low and high registers are sometimes suggested, but only incidentally, and in addition to consideration of style and articulation.

What is the Latin for falsetto if Wilkins's interpretation of falsae voculae is wrong?<sup>2</sup> Mr. D. A. West points out to me that the adjective tinnulus has this meaning in Catullus 61. 13 (of the god Hymen dressed as a bride and speaking in a feminine voice), and in Pomponius fr. 57 Ribbeck (of a man pretending to be a matron in order to receive presents on the Kalends of March at the *Matronalia*). Similarly Apuleius (*Flor.* 3. 5) who refers to Hyagnis' performance on the tibia when acuto tinnitu et gravi bombo concentum musicum miscuit, contrasts the highest harmonics of the instrument with its bass notes. Tacitus (Dialogus 26) writing of the vicious style of certain orators compares the tinnitus Gallionis to fucatis et meretriciis vestibus, and it is interesting to note that fucatus here is the equivalent of καταπεπλασμένος when used of applying rouge or other artificial plaster in Ar. Eccl. 878, Luc. Epigr. 38. 3, etc. 3 Gellius (Noct. Att. 7. 14) says that any one of the three oratorical styles may be overdone: cum fucatur et praelinitur, fit praestigiosum (artificial, deceptive). The terminology of these last two passages may be compared to Quintilian's words (1. 11. 6) simplicem vocis naturam pleniore sono circumliniri, quod Graeci καταπεπλασμένον dicunt, while Cicero uses the same metaphor, shortly after the passage about falsae voculae (De Or. 3. 100)—cincinnis et fuco . . . infucata vitia—of the faults in oratory and poetry due to excessive ornamentation.4 The metaphor in cincinnus (for which compare Augustus' well-known gibe at Maecenas in Suet. Aug. 86) is used by Isid. Etym. 3. 20. 13 to explain the rare adjective vinnulus applied to the voice: vinnola est vox mollis atque flexibilis. et vinnola dicta a vinno, hoc est cincinno molliter flexo.5

Tinnulus is found again in Quintilian (2. 3. 9) in connexion with the term cacozelia: nam tumidos et corruptos et tinnulos et quocunque alio cacozeliae genere peccantes certum habeo non virium sed infirmitatis vitio laborare, ut corpora non robore

- <sup>1</sup> To which the Suda adds ἄσματα ἔκλυτα. (For ἔκλυτα cf. Sud. s.v. Άγαθώνειος αὔλησις, Plut. Cleom. 16. 4, Dio Chr. 2. 30, Schol. Ar. Ran. 1309.)
- <sup>2</sup> In Gk. κοκκυσμός has approximately this meaning in Nicom. p. 256. 2, 274. 17: cf. Quint. 11. 3. 52. D. H. Comp. 14 has  $\sigma\pi\alpha\delta$ ονίζω of emasculated sound: cf. also  $\tau \rho \alpha \gamma \ell \zeta \epsilon \nu$ ,  $\tau \rho \alpha \gamma \hat{\alpha} \nu$  of the breaking voice of the adolescent.
- 3 Cf. Lucian (Bis. Acc. 31) where Rhetoric (personified) is accused of τὰς τρίχας εὐθετίζουσαν εἰς τὸ ἐταιρικὸν καὶ φυκίον ἐντριβομένην.
  - 4 Fucatus, etc., appears frequently in
- Cicero—see Sandys's note on Orator 79. Cf. Lucr. 1. 643-4 veraque constituunt quae belle tangere possunt | aures et lepido quae sunt fucata sonore, where the editors seem to exaggerate the novelty of the expression.
- <sup>5</sup> Such a meaning would be appropriate also to οδλον ἀείδοις in A.P. 7. 27. 3 (Antip. Sid.) in an epigram addressed to Anacreon (cf. C.G.L. ii. 329. 24 θριξουλή his cicinnus, id est capilli) but the meaning of this adj. applied to sound is difficult to identify—see Gow-Page, Gk. Anth., Hellenistic Epigrams, ii. 44, and cf. above p. 154, n. 6.

sed valetudine inflantur et recto itinere lassi plerumque devertunt. Here the word takes from its connotation of high pitch the sense of effeminacy and preciosity, and it is interesting that Quintilian's fullest discussion of  $\kappa \alpha \kappa \delta \zeta \eta \lambda o \nu$  (8. 3. 56: id est mala adfectatio . . . nam et tumida et pusilla et praedulcia et abundantia et arcessita et exultantia sub idem nomen cadunt) follows immediately on his mention of  $\pi \epsilon \rho \iota \epsilon \rho \gamma \iota \iota$  (supervacua operositas), the musical use of which I have discussed above. The terms  $\kappa \alpha \kappa \delta \zeta \eta \lambda o \nu$ ,  $\kappa \alpha \kappa \delta \zeta \eta \lambda \iota \iota$  appear first (probably) in Demetrius (186, 239) and describe 'attempted elegance which miscarries and becomes affectation or preciosity'. Plutarch refers to  $\dot{\varphi} \delta \alpha \iota \iota$   $\kappa \alpha \kappa \delta \tau \epsilon \gamma \nu o \iota$   $\kappa \alpha \kappa \delta \zeta \eta \lambda o \iota$  (Mor. 706 d).

Finally in Suet. Nero 20, Nero promised his audience si paullum subbibisset, aliquid se suffritinniturum. Fritinnire is the Latin equivalent of  $\tau \epsilon \rho \epsilon \tau l \zeta \epsilon \nu$  used of the chirrup of the cicada and such-like high-pitched sounds. I do not know whether Nero hoped to screw his divine, but husky, voice up to the pitch of a countertenor or falsettist, but it is true that in the following chapter Suetonius mentions his singing of female roles—tragoedias quoque cantavit personatus... heroidum ac dearum... inter cetera cantavit Canacen parturientem.

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<sup>I</sup> G. M. A. Grube, A Greek Critic: Demetrius on Style, p. 141, with citations from other authors. See also the Ernesti lexica, svv. κακό-ζηλον, affectatio, and the recent discussion in Schenkeveld, Studies in Demetrius on Style,

pp. 86 f.

<sup>2</sup> For the emendation of MS. sufferi tinniturum see C.R. N.S. xv (1965), 253.

<sup>3</sup> Cf. D.C. 62. 10.



Greek Lyric Metre Author(s): W. Headlam

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### GREEK LYRIC METRE.

I.

πόθεν ἐπισσύτους θεοφόρους ἔχεις ματαίους δύας; τὰ δ' ἐπίφοβα δυσφάτω κλαγγᾳ μελοτυπεῖς ὁμοῦ τ' ὀρθίοις ἐν νόμοις πόθεν ὅρους ἔχεις θεσπεσίας ὁδοῦ κακορρήμονας;

These wild and passionate throes,
Whence rush they on thee thronging?
Such terrors wherefore shape in harsh and awful song
And shrill withal? What is it guides thy boding lips
On their ill-uttering path?

That, after all that has been written on the subject, I imagine to be still the question in the bosom of most readers when they are confronted with a piece of Lyric metre at all complicated. Those who are fortunate enough to have an ear for rhythm, and thus the capability of understanding, are still left, it seems to me, to hear a piece of metre as an uninstructed person hears a piece of music: though he may experience to a considerable degree a sense of vague and general satisfaction, he will lack the understanding of a musical adept. But a musician, hearing a sonata, follows what is being done; observes the themes of which the composition is constructed; notes the treatment of them, how they are developed, varied, and combined; perceives their ethical significance, and feels intelligent artistic pleasure. For all that I can see. the books on lyric metre do not put a student in the position to do this. My knowledge of them is imperfect, and if I am doing an injustice I shall be very ready to repair it; but from all that I am able to infer, they do not yet advance the student much beyond the condition of a person who has learnt his notes and keys and bars: they do not show him how a piece of metre is constructed; do not teach him, in the language of musicians, Form.

Put away all a priori theories, and scan the metres with your ear: scan every piece of metre that you come across; observe what rhythmical phrases are commonly combined together; on what occasions they are used, and by what characters.

With one preliminary warning: lyrics, as they are printed in editions, H.S.—VOL. XXII.

are divided as their various editors divide them. In Pindar and Bacchylides they have now, for the most part, been divided rightly; but our texts of the Tragedians are still full of wrong divisions, owing to respect for the divisions in the manuscripts. Disregard the manuscripts entirely. Different manuscripts divide the same metres in quite different ways; even the same manuscript is often inconsistent, not maintaining the same principles in its divisions; and these divisions themselves are often meant to indicate no more than what in Music you would call the *phrasing* and in Metre the *caesura*. One tendency which misleads the scribes habitually into error is to place in the same line words which belong grammatically together. Treat each stanza as though it were continuous, unless you have reason to suppose it not so,—for example, when you come to an *hiatus*; but if you find *hiatus* is avoided both in strophe and antistrophe, you may generally suppose the metre is continuous.

And observe also where any break after a syllable coincides in corresponding stanzas; as for instance in these lines, Soph. Aj. 693 = 706:

I venture to think that there is no one who will not be astonished to discover with what care such corresponding breaks are studied; they always indicate the phrasing, and before the end of this paper we shall see that their significance is often most important.

This is the method I have followed through the whole material of Greek lyric; and the main results I now proceed to give as principles of structure. For me these principles, when once discovered, have illuminated so much darkness that it would surprise me now to find a piece of choric metre which remained obscure. Prof. Blass gives up the metre of Bacchylides xv on Deianira<sup>2</sup>: ' $\kappa a \tau \lambda$   $\delta \acute{a} \kappa \tau \nu \lambda o \nu$  ut videtur, certe magna ex parte; sed est maxima numerorum obscuritas.' I can honestly say that I find it quite intelligible: it contains dactylic phrases, but it belongs to a much-neglected class I shall not speak of in this paper but mean to deal with in my next,—paeonic.

I shall adopt from Dr. Christ the plan of placing dots beneath accented syllables and hyphens after syllables of extra length, as in Ar. Vesp. 275 elt.

<sup>&</sup>lt;sup>1</sup> Just, of course, as printers tend to do: for example, the first verse of Campion's song 'Kind are her answers, But her performance keeps no day; Breaks time as dancers, From their own music when they stray' should continue

All her free favours

And smooth words win g my hopes in vain; but it is printed

All her free favours and smooth words, Wing my hopes in vain.

and has escaped correction both by Mr. Bullen and Mr. Beeching.

<sup>&</sup>lt;sup>2</sup> In his Preface (ed. 2 p. lxviii) Prof. Blass describes this poem truly as a lamentatio lugubris, and asks how that could be in honour of Apollo. A possible answer is suggested by a note of Wernsdorf's on Himerius Ecl. xiii. 6 and 7, p. 213: 'Videtur Sophista hoc loco, ut in Orat. xiv. 10, abitum Flaviani sui comparasse cum reditu Apollinis ad Hyperborcos ac descripsisse cum laetitiam Delphorum ob dei sui praesentiam, tum luctum eorum ob dei abitum: porro autem tetigisse fluvium Alpheum, cuius discessu similiter lugeant Elienses.'

ἐφλέγ—μηνεν αὐτοῦ, where for φλεγ in music there would be a dotted crotchet: and I shall borrow a few simple terms from Music, giving explanations of them. Let no one be afraid, in anticipation of imposing hieratic language; we shall have no use for the terminology of the grammarians,<sup>3</sup> or for those blessed words 'choreic,' 'logacedic,' which proceed so comfortable from the lips of Dr. Schmidt. No one with an ear need be afraid at all: though if he knows the rudiments of music he will apprehend perhaps more vividly; and I would ask him constantly to keep analogies of Music in his mind; for it appears to me that the principles of Form in modern music are the very principles then followed in Greek lyric metre.

The elements in rhythmical construction are not *feet*, but—to adopt the terminology of music—*phrases*. These are phrases, for example:

$$-\stackrel{\smile}{\smile} - \stackrel{\smile}{\smile} - \stackrel{\smile}{\smile} - \stackrel{\smile}{\smile} - \frac{\text{Glyconic}}{\text{Glyconic}}$$

You may, if it pleases you, divide such phrases into feet, as the old grammarians were so fond of doing; all you will have achieved however will amount to just as little as if you had cut up a phrase of music into bars: it is only as a whole that such a phrase becomes an organism and conveys an intelligible idea. It might be called a figure or Motiv, the shortest coherent element in music, which Sir Hubert Parry in the Dictionary of Music describes thus: 'A Figure is any short succession of notes, either as melody or a group of chords, which produces a single, complete, and distinct impression. The term is the exact counterpart of the German Motiv, which is thus defined in Reissmann's continuation of Mendel's Lexicon:—"Motiv, Gedanke, in der Musik, das kleinere Glied eines solchen, aus dem dieser sich organisch entwickelt." It is in fact the shortest complete idea in music; and in subdividing musical works into sections, periods, phrases, the units are the figures, and any subdivision below them will leave only expressionless single notes, as unmeaning as the separate letters of a word.'

Of such rhythmical elements, phrases, motives, figures—or whatever you may choose to call them—there existed a variety in Greek; and they would be recognised in a moment by an educated hearer. What is important is that each brought with it an association; it suggested certain characters,—of gods, or heroes, or of nations; certain subjects; certain shades or regions of emotion. No one who knows anything of Greek feeling for appropriate form will find it difficult to believe that their rhythms too were used appropriately; and he would not be incredulous if this artistic feeling should appear to have guided sensitive metricians into the most delicate subtleties of touch.

Our first business therefore, if we mean to appreciate what is being done in choric metre, is to have learnt the various elements or phrases which lay to a composer's hand to use, and when they are introduced, to recognise them; the second is to know the associations which these various phrases carried with them.

<sup>&</sup>lt;sup>3</sup> If only they had had our system of musical notation they would never have been bewildering to us—or to themselves,

The broadest distinction of character in rhythms is between the *Dorian* and the *non-Dorian*. The non-Dorian may for the present purpose be classed together under the general names *Ionic*, *Asiatic*, *Eastern*, including Lydian, Phrygian etc.; Anacreon's belong of course to this division. All such are markedly different in spirit and associations from the rhythms which the Dorians made their own; these are so few and simple and so easy to be learnt that they may as well be stated here:

- 1 the enhoplion  $= | + \circ \circ \circ = |$ , a dactylic phrase in tempo staccato, beginning with or without the anacrusis.
- 2 the *epitrite*, most commonly in this arrangement - -, the movement in which Latin 'trochaics' naturally went.
- $4 \div \circ \stackrel{\smile}{=} \div \circ -$ , e.g. Aesch. Pers. 869, Ar. Ran. 825 γηγενεί φυσήματι, Eur. Cycl. 371.
- $5 \circ \circ -$ , e.g. Aesch. Pers. 873, Soph. Trach. 525 προσμένουσ' ἀκοίταν, Ar. Ran. 674 sqq., and Eur. Andr. 761:

οὔτοι λείψανα τῶν ἀχαθῶν ἀνδρῶν ἀφαιρεῖται χρόνος· ά δ' ἀρετὰ καὶ θανοῦσι λάμπει.

The same figures are combined in the Stesichorean verses  $^4$  of Ar. Pax 775 = 796:

Μοῦσα σὺ μὲν πολέμους ἀπωσαμένα μετ' ἐμοῦ τοῦ φίλου χόρευσον κλείουσα θεῶν τε γάμους ἀνδρῶν τε δαῖτας καὶ θαλίας μακάρων σοὶ γὰρ τάδ' ἐξ ἀρχῆς μέλει.

Dorian metre moves in strongly-marked 4 time. To convey the nature of it in a single word, I should describe it as *Handelian*—in his square processionals and martial songs.<sup>5</sup>

It was the expression of the Dorian temper, rigorous, energetic, masculine, severe; the appropriate vehicle for their ideals, ἀρετά, ἀνδρεία, αὐτάρκεια: appropriate of course also to the Dorian heroes, Heracles, the Dioscuri, Helen. Wordsworth's ode to Duty, 'Stern Daughter of the voice of God,' or Tennyson's upon the Death of Wellington could not have been written by a Greek except in Dorian metre; to write of ἀρετά or ἀνδρεία in Anacreontic would have been absurd and ludicrous. Dorian is the proper metre, as in the passage from the Andromache just quoted, in Med. 624, and in this fragment of Euripides (893)

<sup>&</sup>lt;sup>4</sup> The scholia are not correctly treated by Bergk on Stesichorus 35 and 36 p. 220.

<sup>&</sup>lt;sup>5</sup> Dorian metre in burlesque, as Eur. Cycl. 367 sqq., Ar. Ran. 814 sqq., would have just

the same effect as the delightful Handelian burlesques of Sullivan; in *Princess Ida* for example, 'This helmet, I suppose, Was made to ward off blows.'

άρκεῖ μετρία βιοτά μοι σώφρονος τραπέζης, τὸ δ' ἄκαιρον ἄπαν ὑπερβάλλον τε μὴ προσείμαν.

Accordingly the moral verses attributed to the Sages are in Dorian; <sup>6</sup> and this continued to be the metre used in philosophic verse, as in the fragments of Cercidas on Diogenes and  $\sigma o \phi i a$  (Bergk *Poetae Lyrici Graeci* II p. 513), and in Aristotle's hymn to 'A $\rho \epsilon \tau \dot{a}$  (ib. p. 360):

'Αρετά, πολύμοχθε γένει βροτείω, θήραμα κάλλιστον βίω, σᾶς πέρι, παρθένε, μορφᾶς καὶ θανεῖν ζαλωτὸς ἐν Ἑλλάδι πότμος καὶ πόνους τλῆναι μαλεροὺς ἀκάμαντας· τοῖον ἐπὶ φρένα βάλλεις καρπὸν ἰσαθάνατον τοιοῦ τε κρείσσω καὶ γανέων μαλακαυγήτοιό θ' ὕπνου· σεῦ δ' ἔνεχ' οὐκ Διὸς 'Ηρακλέης Λήδας τε κοῦροι πόλλ' ἀνέτλασαν ἔργοις σὰν ἀγρεύοντες δύναμιν,

12 σοις δὲ πόθοις 'Αχιλεὺς Αἴας τ' 'Ατδα δόμον ἦλθον,

σᾶς δ' ἔνεκεν φιλίου μορφᾶς καὶ 'Αταρνέος ἔντροφος ἀελίου χήρωσεν αὐγάς·

τοιγὰρ ἀοίδιμος ἔργοις, ἀθάνατόν τε μιν αὐξήσουσι Μοῦσαι Μναμοσύνας θύγατρες, Διὸς ξενίου σέβας ἄζου-

σαι 8 φιλίας τε γέρας βεβαίου.

The enhoplion belonged especially to the Dioscuri (Ath. 184 f, Schol. Pind. P. ii. 127 Boeckh), and was therefore used in speaking of them; as by Pind. O. iii. 1

enhoplion Τυνδαρίδαις τε φιλοξείνοις άδειν καλλιπλοκάμφ θ' Έλένα dactylo—epitrite

and N. x. 51. So in Eur. Hel. 1479=1496

δι' ἀέρος εἴθε ποτανοὶ γενοίμεθα Λίβυες <ώς> οἰωνοὶ στοιχάδες <sup>9</sup> ὅμβρον λιποῦσαι χειμέριον νίσσονται πρεσβυτάτα = μόλοιτέ ποθ' ἵππιον οἶμα δι' αἰθέρος ἱέμενοι λαμπρῶν ἄστρων ὑπ' ἀέλλ .ι- σι, παῖδες Τυνδαρίδαι, οῦ ναίετ' οὐράνιοι

<sup>6</sup> K. O. Müller History of Greek Literature I p. 251.

The active  $\[ \tilde{\alpha} \] \zeta o \nu \tau \alpha \]$  is in O.C. 134.

οίωνοὶ στοχάδες ὄμβρον λιποῦσαι χειμέριον

The antistrophe is restored by transposition.

<sup>&</sup>lt;sup>7</sup> Wilamowitz - Moellendorff for καρπόν εἰσ ἀθάνατον (v.l. καρπόν τ' ἀθάνατον): so in Aesch. Ag. 950 the MSS. give εἰσ ἄργυρον for ἰσάργυρον, in Ath. 689 b εἰσ ἀργυροῦν τισ χεῖρα for ἰσαργυρον τ' εἰσ χεῖρα. The reading of v. 12 (enhoplion repeated) is due to the same scholar; the MSS. have 'Αίδαο δόμους.

<sup>8</sup> Crusius for ἄρξουσαι, v.l. αὕξουσαι: so αζονται has been restored for ἄρξονται in Pers. 592.

<sup>9</sup> The reading of the MSS. and of the Aldine

too is  $\sigma\tau o\lambda d\delta \epsilon s$ : I have corrected this and the metre at the same time. The editors follow the MS., which divides the words according to their grammatical construction

the opening is enhoplion for the Tyndarids in the antistrophe. Stesichorus used it in his palinode on Helen,

οὐκ ἔστ' ἔτυμος λόγος οὖτος οὐδ' ἔβας ἐν ναυσὶν εὐσέλμοις epitrite οὐδ' ἵκεο πέργαμα Τροίας.

An Epode <sup>10</sup> corresponded to a coda. It was constructed, as a rule, out of the same rhythmical elements or phrases as the strophe; contained the same material, but arranged in a different and subtler combination. Since therefore it contains, as a rule, allusions to the material of the strophe, it often contributes towards making certain what the rhythmical elements of the strophe really are: conversely, we can often determine the metre of the epode from the strophe. Here is a very simple case from the epode of the Doric chorus which describes the fight between Heracles and Achelous, Soph. Trach. 497; it should be divided thus:

ην δ' ἀμφίπλεκτοι 11 κλίμακες ην δὲ μετώ—
πων ὀλόεντα πλήγματα καὶ στόνος ἀμφοῦν
ά δ' εὐῶπις ἀβρὰ epitrite
τηλαυγεῖ παρ' ὄχθω ,,
ήστο τὸν ὃν
προσμένουσ' ἀκοίταν.

The first line is the normal dactylo epitrite, but the MS. makes a complete line of the grammatical clause ἢν δ' ἀμφίπλεκτοι κλίμακες. The same thing is done by Nauck in a moral fragment (not necessarily Tragic) p. 867:

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ὧ χρυσέ, βλάστημα χθονός, οἷον ἔρωτα βροτοἷ-σῑ φλέγεις, πάντων κρατιστεύων, πολέμοις δ' Αρεως κρείσσον' ἔχων δύναμιν, <τὰ> πάντα 12 θέλγεις· ἐπὶ γὰρ 'Ορφείαις μὲν ຜίδαἷς εἴπετο δένδρεα καὶ θηρῶν ἀνόητα γένη, σοὶ δὲ καὶ χθὼν πᾶσα καὶ πόντος καὶ ὁ παμμήστωρ 'Αρης - - 13
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Besides other incorrect divisions, Nauck prints  $\mathring{\omega}$   $\chi\rho\nu\sigma\acute{\epsilon}$ ,  $\beta\lambda\acute{a}\sigma\tau\eta\mu a$   $\chi\theta\sigma\nu\acute{o}$ , as though it were a separate line.

When Dorian metre is used by Orientals there is always a reason to be looked for. Thus the Chorus in *Tro*. 801 is about the sack of Troy by

<sup>10</sup> Epodes belong properly to Dorian metre, and are usual with paeonic. All the purely Dorian odes of Pindar, except P. xii and N. ix, have epodes; all the rest that have none (O. i, iv, xiv, P. vi, N. ii, iv, I. viii) are in more or less varied Lydian or Ionic rhythms: so are the only three complete odes of Bacchylides that have not, iv, vi and xvii. The strophes of iii, which tells the story of the Persians and the Lydian Croesus, are in Lydian or Ionic, but

the epode is in Doric because it is addressed to Hiero of Sicily; and we are prepared for this by a Doric phrase (enhoplion) in the 2nd and 3rd lines of the strophes.

<sup>11</sup> Or αμφίπλικτοι?

<sup>12</sup> Or  $<\sigma ύμ>παντα$ . The reading of the 2nd line is uncertain, but as I have written it, it is metre.

 $<sup>^{13}</sup>$  E.g.  $\partial\pi$ a $\delta\epsilon\hat{\imath}$  or  $\lambda$ a $\tau$ p $\epsilon\acute{\nu}\epsilon\imath$ : the metre is incomplete without this ending.

Telamon and Heracles; that in Hec. 889, a lament for the later fall of Troy, is partly in Doric for the Greeks:

891 τοῖον Ἑλλάνων νέφος ἀμφί σε κρύπτει
911 κέλευσμα δ' ἢν κατ' ἄστυ Τροίας τοδ', 'ὧ παῖδες Ἑλλάνων πότε δὴ πότε τὰν Ἰλιάδα σκοπιὰν πέρσαντες ἤξετ' οἴκους;'
925 epode τὰν τοῖν Διοσκούροιν Ἑλέναν κάσιν Ἰδαιόν τε βούταν....

If the Chorus in the *Persae* of Aeschylus use Dorian metre for their long descriptive geographical account 855 sqq., it is because that was the metre which had been used by Stesichorus for such recitals; that is the reason it was used by Philoxenus also in his portentous catalogue. Another piece of Stesichorean Doric is a fragment of Aeschylus from the ' $H\rho\alpha\kappa\lambda\epsilon\hat{\imath}\delta\alpha\iota$ : describing the expedition of Heracles against Geryoneus, the Chorus use the metre of Stesichorus in his  $\Gamma\eta\rho\nu\nu\nu\eta t$ ; Aesch. fr. 74

#### èκεῖθει

δρμενος ὀρθόκερως βοῦς ἤλασ' ἀπ' ἐσχατιᾶν γαίας, ἀκεανὸν περάσας ἐν δέπα χρυσηλάτω βοτῆράς τ' ἀδίκους κατέκτα δεσπότην τε τρίπτυχον τρία δόρη πάλλοντα χερσίν, τρία δ' ..... σάκη προτείνων τρεῖς τ' ἐπισσείων λόφους στεῖχεν ἴσος "Αρει βίαν. 14

So much for Dorian. To take one opposite example, metres appropriate to Dionysus were Glyconic, as Aesch. fr. 355, Soph. fr. 174, Eur. fr. 586, Pind. fr. 153; and Ionic a minore as Bacchae 64 sqq., Ar. Ran. 323 sqq.; for a  $\kappa\hat{\omega}\mu$ os, the Anacreontic  $\circ \circ - \circ - - -$  as in Cyclops 491 sqq.

A stanza might be constructed entirely in one rhythm, as the 4th Pythian is in Dorian metre purely; or it might be made of two or more combined; or the briefest phrase even of a different metre might be introduced in passing, when it was appropriate to the sense: as in Soph. *Trach.* 953

εἴθ' ἀνεμόεσσά τις
γένοιτ' ἔπουρος ἐστιῶτις αὔρα
ἥτις μ' ἀποικίσειεν ἐκ τόπων ὅπως
τὸν Ζηνὸς ἄλκιμον γόνον
μὴ ταρβαλέα θάνοιμι μοῦνον εἰσιδοῦσ' ἄφαρ

<sup>14</sup> εστειχισος αρηβιαν MS.; I give the correction of Weil, cf. Pind. I. ii. 16: ἴσος ᾿Αρει στεῖχεν βίαν would be as good, cf. Pind. P. iv. 8; but ἔστε χ᾽ ἶσος ᾿Αρει βίαν would be a glyconic

line quite foreign to the metre. In the previous line τρία διὰ τῆσ σάκου προτείνων awaits correction; I cannot scan Wecklein's τρία δὲ λαιαῖς σάκη προτείνων.

At v. 4 this has lapsed insensibly into Dorian epitrite for describing Heracles, and abandons it again immediately.

Thus any phrase or figure carrying with it an association could be used precisely as modern music uses a *Leit-motiv* or 'guiding theme'; for explanation of which term I quote again Sir Hubert Parry: 'Leit-motive,' he says 'consist of figures or short passages of melody of marked character which illustrate, or as it were label, certain personages, situations, or abstract ideas which occur prominently in the course of a story or drama of which the music is the counterpart; and when the situations recur, or the personages come forward in the course of the action, or even when the personage or idea is implied or referred to, the figure which constitutes the leit-motif is heard.'

Metricianly accomplishment was shown in passing from one rhythm to another while keeping the movement going all the time. So far as I discover, there were three devices which enabled you to manage these transitions; (1) by link: (2) by echo: (3) by overlapping.

A connecting link or copula is a syllable interposed between two lines to enable the movement to be carried on without a rest. It is so designed that rhythmically it could belong to either line; but while it is common to them both, you are to feel that it is intermediate between them; so for the instruction of the ear it is made to consist usually, on the first occurrence, of a single separate word. But when the ear has thus been made to understand the phrases which the movement is constructed of, it does not need that explanation any longer, and succeeding strophes do not think it necessary to observe the separation of the link.—This is only one application of a general principle:—The first strophe states the metre plainly; afterwards, when the metre is firmly established in the ear, it can be trusted to accept the liberty of an equivalent variation. This will seem a matter of course to those who know anything of music. 15—Examples of what I mean by links are marked off here by dotted lines:

Aesch. Cho. 379

τοῦτο διαμπερέως <sup>16</sup> ἵκεθ' ἄπερ τε βέλος | Ζεῦ | Ζεῦ κάτωθεν ἰάλλων <sup>16</sup> ὑστερόποινον ἄταν =393

καὶ πότ' ἂν ἀμφιλαφης Ζεὺς ἐπὶ χεῖρα βάλοι; φεῦ φεῦ κάρανα δἄťξας, πιστὰ γένοιτο χώρα.

fact.

<sup>16 &#</sup>x27;Or of metre either' I might almost say; only that Bergk on Nem. vi. 7 p. 279 laid down exactly the opposite for Pindar,—that his metre gets more strict as it proceeds: 'in prima stropha correptio minus offendit, solet enim poeta deinceps severiore lege uti.' It would be strange indeed if it were so, but it is simply not the

<sup>16</sup> I have no doubt that the readings given here are right so far as metre is concerned. In the antistrophe I take it there is an anacoluthon as in the strophe: 'smit: the heads, and that will be a pledge!' (or 'and let that be a pledge').

Soph. El. 480
. . . . . άδυπνόων κλύουσαν
ἀρτίως ὀνειράτων
οὐ γάρ ποτ' ἀμναστεῖ γ' ὁ φύσας
Ἑλλάνων ἄναξ

οὐδ' ἱά παλαιὰ χαλκόπλακτος ἀμφάκης γένυς

Ar. Vesp. 273

μῶν ἀπολώλεκε τὰς ἐμβάδας ἢ προσέκοψ' | ἐν | τῷ σκότῷ τὸν δάκτυλόν που εἶτ' ἐφλέγ—μηνεν αὐτοῦ

Eur. Hipp. 752

κακονυμφοτάταν ὄνασιν,
η γὰρ ἀπ' ἀμφοτέρων
η Κρησίας ἐκ γᾶς δύσορνις
ἔπτατο κλεινὰς ᾿Αθάνας
Μουνύχου δ' ἀκταῖσιν ἐκδή—
σαντο πλεκτὰς πεισμάτων ἀρ—

χὰς ἐπ' ἀπείρου τε γᾶς ἔβασαν.

=495

=282

έξαπατῶν ἔλεγέν θ' ὡς φιλαθήναιος ην καὶ τὰν Σάμφ πρῶτος κατείποι

=763

άπὸ νυμφιδίων κρεμαστὸν άψεται ἀμφὶ βρόχον λευκᾳ καθαρμόζουσα δείρᾳ δαίμονα στυγνὰν καταιδε— σθεῖσα τάν τ' εὔδοξον ἀνθαιρ— ουμένα φάμαν ἀπαλλάσ— σουσά τ' ἀλγεινὸν φρενῶν ἔρωτα.

In the following passage we have a rapid triplet as a link:

Eur. Andr. 136

γνῶθι δ' οὖσ' ἐπὶ ξένας δμωὶς ἐπ' ἀλλοτρίας

πόλεος ἔνθ' οὐ φίλων τιν' εἰσορậς

=142

δεσποτῶν ἐμῶν· φόβῷ δ' ἡσυχίαν ἄγομεν· τὸ δὲ σὸν Ιοἴκτῷ φέρουσα τυγχάνω

*Echo* is the ending of a line repeated as the beginning of the next. Thus in the following stanza there is a constant reiteration of the figure  $\circ$   $\div$  which serves to begin lines 4 and 8:

Bacchylid. iv

"Ετι Συρακοσίαν φιλεί
πόλιν ό χρυσοκόμας 'Απόλλων
ἀστύθεμίν θ' 'Ιέρωνα γεραίρει·

4 τρίτον γὰρ παρ' ὀμφαλὸν ὑψιδείρου χθονὸς
Πυθιόνικος ἀείδεται ἀκυπόδων ἀρετὰ σὺν ἵππων.
δύο τ' 'Ολυμπιονίκας

8 ἀείδειν· τί φέρτερον ἢ θεοίσιν
φίλον ἐόντα παντοδαπῶν
λαγχάνειν ἄπο μοῦραν ἐσθλῶν; 18

<sup>&</sup>lt;sup>18</sup> This being mutilated, I have taken the first half from one strophe and the second from the other. In v. 16  $\pi \acute{a} \rho \epsilon \sigma \tau \iota \nu \nu \iota \nu$  is rightly restored by Prof. Blass.

In continuance by echo this particular figure  $\sim$  — does great service. When existing by itself it is called *bacchiac*, and used for short moments of violent excitement: here we see this bacchiac changing to glyconic, Eur. Supp. 1015

όρῶ δὴ τελευτὰν bacchiac τν' ἔστακα· τύχα δέ μοι glyconic ξυνάπτει· ποδὸς ἄλμα τᾶς εὐκλείας χάριν ἔνθεν ὁρ-μάσω τᾶσδ' ἀπὸ πέτρας.

It is very common to echo a figure immediately before the conclusion of a stanza: thus in the Dorian of Pind. I. 1,

είξον ω 'πολλωνιάς αμφοτεράν τοι χαρίτων σὺν θεοῖς ζεύξω τέλος.

and this little offspring  $- \circ \circ -$  is duly mentioned at the beginning of the epode.

Not only the ending, however, may be echoed, but some other portion of a previous line; in this pretty little glyconic stanza from the 2nd Nemean for instance:

έν έσλοῦ Πέλοπος πτυχαῖς ὀκτὰ στεφάνοις ἔμιχθεν ἤδη· ἐπτὰ δ' ἐν Νεμέᾳ, τά δ' οἴ-

4 κοι μάσσον' ἀριθμοῦ
Διὸς ἀγῶνι· τὸν ὧ πολῖται κωμάξατε Τιμοδήμου σὺν εὐκλέϊ νόστω.
8 ἀδυμελεῖ δ'

9 εξάρχετε φων**ậ**.

άδυμελε $\hat{i}$  is an echo of the  $-\circ \circ$  — which has been heard in the interior of all the lines preceding.

Soph. Aj. 221 will lead us a little further:

- 1 οίαν έδή-λωσας άνδρὸς αίθονος άγγελίαν
- 2 ἄτλατον οὐδὲ φευκτὰν
- 3 των μεγάλων Δαναών ὕπο κληζομέναν
- 4 τὰν ὁ μέγας μῦθος ἀέξει.
- 5 οἴμοι φοβοῦ-μαι τὸ προσέρπον περίφαντος ἀνὴρ
- 6 θανείται παραπλάκτω χερί συγκατακτάς
- 7 κελαινοίς ξίφεσιν βοτά καὶ
- 8 βοτήρας ίππονώμας.

 $\theta a \nu \epsilon \hat{\iota} \tau a \iota$  in v. 6 and  $\kappa \epsilon \lambda a \iota \nu o \hat{\iota} s$  in v. 7 echo the endings of the lines preceding them. The movement of  $\dot{a} \gamma \gamma \epsilon \lambda \dot{\iota} a \nu$  in v. 1 is repeated in v. 3 and twice echoed in v. 4. The second time it occurs in v. 4 it is extended to

 $-\circ \circ - |-:$  this is taken up in the next line and continues to v. 7, from which a return is made to the rhythm of the opening lines :  $\sigma\iota\nu$  βοτὰ καὶ | βοτῆρας ἱππονώμας = ἀγγελίαν | ἄτλατον οὐδὲ φευκτάν.

The way by which the return is made from one rhythm to another in v. 7 is an example of the last and subtlest form of shift. I call it overlapping. You expect the rhythm to continue  $\kappa \epsilon \lambda a_{\ell} \nu \hat{o}_{\ell} s$   $\xi \ell \phi \epsilon \sigma_{\ell} \nu \kappa a \lambda$ , but  $\xi \ell \phi \epsilon \sigma_{\ell} \nu$  affords an opportunity of continuing with anapaestic (or dactylic) movement,  $\xi \ell \phi \epsilon \sigma_{\ell} \nu \beta o \tau \hat{a} \kappa a \lambda$ : so that what you get is a line of which the first part is in one rhythm and the last part in another, while the middle part is common to them both:

# κελαινοίς ξίφεσιν βοτά καὶ

This device of overlapping enabled a metrician sometimes to get even a continuous contrapuntal effect of rhythm. The following from the Prometheus Vinctus is a very skilfully composed example; where the Ocean Maidens are compassionating Prometheus in mournful Anacreontic measures. The chief subject is

<u>- - 0 - - 0 0 - - 20</u>

a well-known rhythm, e.g.

Ar. Nub. 949 νῦν δείξετον τω πισυνώ τοῖς περιδεξίοισιν
950 λόγοισι καὶ φροντίσι καὶ γνωμοτύποις μερίμναις.
Cratinus fr. 172 ἄνδρας σοφούς χρη τὸ παρὸν πρᾶγμα καλώς εἰς δύναμιν τίθεσθαι.

But here, by repeating the first section thus,

it is so contrived that another Anacreontic phrase (2)  $\circ \circ - \circ - \circ - \circ$  is heard moving underneath against it:

<sup>&</sup>lt;sup>19</sup> See the schol. on v. 130.

<sup>&</sup>lt;sup>20</sup> The first section presently is numbered (1), the second (3).

<sup>?1</sup> Probably εἰσιδούσα or εἰσιδοῦσαν: then the metre is continuous throughout.

In setting this to music we should now design one melody for (1) and a different, but of course harmonious, melody for (2): whether the Greeks attained to counterpoint in metre and yet failed to think of counterpoint in melody I cannot say.

It will be observed how carefully the common elements are marked off by separation of the words. So it is in the fragment (Anacr. 56) quoted by the schol.:

where the second part is Ionic a minore. Here is another fragment of that fine metrician, Anacreon fr. 19:

This begins with a glyconic, and you expect it to continue so,  $\pi \acute{\epsilon} \tau \rho \eta s$   $\acute{\epsilon} s$   $\pi o \lambda \iota \acute{o} \nu \circ - :$  instead of which it shifts, through the common element  $\acute{\epsilon} s$   $\pi o \lambda \iota \acute{o} \nu$ , to choriambic.

> δικαίων ἀδίκους φρένας παρασπᾶς ἐπὶ λώβα.

in Agam. 707, άβροβίων in Bacchyl. xvii. 2.— When anapaestic dimeters and iambic trimeters have not the usual caesura, it will be found that a long word is the condition of the license, as Agam. 781 τῷ δυσπραγοῦντί τ' ἐπιστενάχειν, 784 καὶ ξυγχαίρουσιν ὁμοιοπρεπεῖς ἀγέλαστα πρόσωπα βιαζόμενοι, Soph. fr. 300 πέρδικος ἐν κλεινοῖς 'Αθηναίων πάγοις (epitrite movement).

<sup>22</sup> At 4 we get a new figure which is repeated at the close: in the antistrophe it is indicated by caesura; and I think there would have been a caesura in the strophe too, if it had not been that κραιπνοφόροι is one long word: δῆτα, θοαὶ would have been unrhythmical, but κραιπνοφόροι does not spoil the movement. Other cases in passages to be quoted presently are πρασσομένα

At 7 the ending  $-\circ\circ$  — is taken up with choriambic movement; while at 8 we begin to hear a sound of three consecutive long syllables, which recurs on several occasions; Antig. 781 = 791:

	1	2
Ερως ἀνίκατε μάχαν τὸ καὶ δικαίων ἀδίκους		δς έν κτήμασι πίπτεις παρασπậς ἐπὶ λώβα
2	2	3
δς έν μαλακαίς πα	ρειαίς ν	εάνιδος έννυχεύεις
σὺ καὶ τόδε νεῖκος ἀ	νδρῶν ξ	ύναιμον έχεις ταράξας
4 5 6	4	5
1		8
φοιτᾶς δ' ὑπερπόντιο	ς ἔν τ'	άγρονόμοις αὐλαῖς
		ίμερος εὐλέκτρου
7		•
7		8
		μος οὐδεὶς
νύμφας τῶν μεγάλ	ων ού τ	ι πάρεδρος <sup>23</sup>
		$\overline{2}$
4 5 8		
οὔθ' ἱάμερίων σέ γ' ἀν	θρώπων	ό δ' ἔχων μέμηνεν
θεσμῶν, ἄμαχος γὰρ ἐ		
	4 5	6

Those who may care to pursue this method of analysis and wish for a good field to practise in will find it in the lyrics of Antigone which follow, in El.~1058 and in Ajax~693: except that Ant.~850=869 are both, I think, corrupted and should be

ίω δύστανος, οὐ βροτοΐσιν οὔτ' ἐν νεκροῖς, μέτοικος οὐ ζωσιν, οὐ θανοῦσιν. = ιω κύρσας γάμων ιω κάσις δυσπότμων, θανων έτ' ουσαν κατήναρές με.

There is a very beautiful example of transition in a passage of admirable metre which will serve at the same time to illustrate nearly all the principles I have advanced; Aesch. Agam. 686 = 702:

- 1 τίς ποτ' ἀνόμαξεν ὧδ' ες τὸ πᾶν ἐτητύμως
- 2 (μή τις ὅντιν' οὐχ ὁρῶμεν προνοίαισι τοῦ πεπρωμένου
- 3 γλωσσαν έν τύχα νέμων ;)
- 4 τὰν δορίγαμβρον ἀμφινεικη θ'
- 1 Ἰλίφ δε κῆδος ὀρθ ώνυμον τελεσσίφρων
- 2 μηνις ήνυσεν τραπέζας ατίμωσιν ύστέρφ χρόνφ
- 3 καὶ ξυνεστίου Διὸς
- 4 πρασσομένα τὸ νυμφότιμον

<sup>23</sup> οὐχὶ πάρεδρος Dindorf: the MS. is τῶν μεγάλων πάρεδρος ἐν ἀρχαῖς, a variation without parallel in choriambic metre, and the contrary of the sense. Sophocles is alluding to the proverb θεσμὸν Ἑρως οὖκ οἶδε βιημάχος used by Paul. Sil. A.P. v. 193 in his clever answer to Agathias,

ib. 192. Δίκη, Θέμις, Νόμος, Αἰδώς are πάρεδροι of Zeus (O.C. 1267, 1382, Pind. O. viii. 21, Plut. Alex. 52, Orpheus in 'Dem.' 772. 26 and fr. 18 in Proclus on Aleib. I.); but Έρως is not with them; Έρως is like Nature,— $\mathring{\eta}$  φύσις εβούλεθ',  $\mathring{\eta}$  νόμων οὐδὲν μέλει Eur. fr. 920.

5 Έλέναν; ἐπεὶ πρεπόντως 5 μέλος ἐκφάτως τίοντας, 6 έλέναυς έλανδρος έλέπτολις 6 ύμεναιον, δς τότ' επερρεπεν 7 ἐκ τῶν ἁβροτίμων 7 γαμβροίσιν ἀείδειν. 8 προκαλυμμάτων ἔπλευσε 8 μεταμανθάνουσα δ' υμνον 9 Ζεφύρου γίγαντος αὔρα 9 Πριάμου πόλις γεραιά 10 πολύανδροί 10 πολύθρηνον, 11 τε φεράσπιδες κυναγοί 11 μέγα που στένει κικλήσκουκατ' ἴχνος πλατᾶν ἄφαντον σα Πάριν τὸν αἰνόλεκτρον 12 12 13 τάμπροσθ' ή πολύθρηνον αίων' 13 κελσάντων Σιμόεντος ἀκτὰς αμφὶ πολιταν έπ' ἀεξιφύλλους 14 15 δί ἔριν α ί μ ατόεσσαν 15 μέλεον αξμ' ανατλάσα.

Here we have three metres: trochaic with syncopation, 1-3; Ionic a minore or Anacreontic, 4-6 and 8-12; glyconic 6-7 and 13-15. These corresponding stanzas are constructed with such artifice,—there are so many antithetic meanings woven in so close a texture,—that I give a rendering designed to bring them out, endeavouring also to suggest something of the metrical effect; though not of course by use of the same metres, which in English has rarely that result:

Who named her all so shrewdly? -Was't One beyond our ken, By glimpse of Order fated His happy lips who moved?— This Helena, so rudely Still warred about by men, This bride with iron mated,— Sure Hell enow she proved! When lightly from the silken-tissued Veils before her bower emerging Forth to Eastward sail she issued, Breeze of earth-born Zephyrus urging— Forth to Eastward sail Men swarming after, hot in quest, Fierce myriad hunters, all addrest With shields, that harrier-like pursued Fast on a sightless trail, of oars Beached upon Simoïs' leafy shores, Full cry, in bloody feud!

Revenge will surely render
That pairing well-repaired;
Will make this dear alliance
Be all too dear for Troy!
Of high Zeus Home-defender
And friendly Table shared
Repays that prime defiance
On all that uttered joy;

So loudly once in gay carousal
Bride with Hymen-song would honour,—
Kinsmen, when the time of spousal
Bade them heap their praise upon her—
Ah but at this time,
Though late the lesson, learned grown
With age-long suffering of her own
Sons' blood so lamentably shed,
That ancient City loud, I ween,
Laments, with practice-perfect Threne,
'O Paris, evil-wed!'

The rhythmical elements are three, and to appreciate their dramatic significance we must consider strophe and antistrophe together. The opening trochaics in both cases are for the expression of their own stern moral and religious views, and this metre they continue till they come to painting Helen, when they shift by means of a *link*—a syllable kept studiously separate on the first occurrence—

## γλῶσσαν ἐν τύχᾳ νέμων τὰν ἱδορίγαμβρον ἀμφινεικῆ θ'

the break in each case being marked by the division of the words. The purpose of this transition becomes fully apparent in the antistrophe; for this glyconic was the metre of the refrain in wedding-songs:

'
$$\Upsilon$$
μὴν  $\eth$  ' $\Upsilon$ μέναι' ' $\Upsilon$ μήν, ' $\Upsilon$ μὴν ' $\Upsilon$ μέναι'  $\eth$ . $^{25}$ 

Thus in Eur. I.A. 1036 sqq. where the marriage of Peleus and Thetis is described, this is the natural conclusion of the stanzas:

1055 πεντήκοντα κόραι Νήρεως =1076 Νηρήδων έθεσαν πρώτας γ ά μ ο υ ς έχόρευσαν Πηλέως θ' ὑ μ ε ν α ί ο υ ς.

<sup>&</sup>lt;sup>24</sup> Transition to this metre is always, I believe, prepared by  $o \div -$  preceding; therefore the corrupt verses Soph. O. T. 1210=1219 have yet to be restored correctly.

<sup>&</sup>lt;sup>25</sup> Eur. Tro. 307 sqq., Ar. Av. 1731 sqq., Pax 1329 sqq., Catull. 61. 4, Plaut. Casina 799.

Our transition to this metre here might well have been accentuated both by melody and orchestration,—wood-wind at this point, since the  $\hat{\nu}\mu\acute{e}\nu\alpha\iota\sigma$  was accompanied by flutes, whereas Anacreon was  $a\dot{\nu}\lambda\acute{\omega}\nu$   $\dot{a}\nu\tau\acute{\iota}\pi a\lambda\sigma$ ,  $\phi\iota\lambda\sigma\beta\acute{a}\rho\beta\iota\tau\sigma$ s (Critias in Ath. 600 e). It is just as though a phrase were introduced from some familiar Wedding-march. Then the ending  $\dot{a}\epsilon\acute{\iota}\delta\epsilon\iota\nu$  enables the Anacreontic to be resumed at once without further preparation, and the change of metre sharply points the contrast in the sense, between the joyful  $\dot{\nu}\mu\acute{e}\nu\alpha\iota\sigma$ s then and the melancholy  $\theta\rho\acute{\eta}\nu\sigma$ s now.<sup>26</sup>

Surely this is very beautiful.

The Θησεύς of Bacchylides opens with this prelude,

xvii. 1 
$$\frac{1}{\beta a \sigma \iota \lambda \epsilon \hat{\upsilon} \tau \hat{a} \nu}$$
  $\frac{i \epsilon \rho \hat{a} \nu}{\delta o \lambda \iota \chi \hat{a} \nu}$   $\frac{i \lambda \theta a \nu \hat{a} \nu}{\hat{a} \mu \epsilon \iota \psi a \varsigma}$ 

$$= 16 \qquad \nu \dot{\epsilon} ο \nu \frac{\hat{\eta}}{\hat{\eta}} \lambda \theta \epsilon \nu \qquad \delta o \lambda \iota \chi \hat{a} \nu \qquad \hat{a} \mu \epsilon \iota \psi a \varsigma$$

$$= \frac{2}{\tau \hat{\omega} \nu} \frac{2}{\delta \beta \rho o \beta \iota \omega \nu} \frac{i \nu a \xi}{\delta \nu a \xi} \qquad i \omega \nu \omega \nu$$

$$= \kappa \hat{a} \rho \nu \xi \mid \frac{\pi o \sigma \hat{\iota} \nu}{1} i \sigma \theta \mu \iota \alpha \nu \qquad \kappa \dot{\epsilon} \lambda \epsilon \nu \theta o \nu$$

At 2 it lapses into a modification of glyconic; but the prelude is Ionic a minore, and this movement continues to the break at  $i\epsilon\rho\hat{a}\nu$ . The meaning is apparent; for this metre more than any other meant 'Ionic', and he is speaking of the  $\dot{a}\beta\rho\sigma\beta'\omega\nu$  'I $\dot{\omega}\nu\omega\nu$ .

The 7th Olympian of Pindar, for Diagoras of Rhodes, is in Doric rhythm with a slight exception. This is that famous ode which the Rhodians inscribed in golden letters in the temple of the Lindian Athena:

Φιάλαν ώς εἴ τις ἀφνειᾶς ἀπὸ χειρὸς έλῶν ἔνδον ἀμπέλου καχλάζοισαν δρόσω δωρήσεται νεανία γάμβρω προπίνων οἴκοθεν οἴκαδε, πάγχρυσον, κορυφὰν κτεάνων, συμποσίου τε χάριν κᾶδός τε τιμάσαις έόν, ἐν δὲ φίλων παρεόντων θῆκέ νιν ζαλωτὸν ὁμόφρονος εὐνᾶς.

The only variation from pure Dorian here is the prelude—singular and remarkable—to the first line and the last. Each time, in the opening strophe, it is separated from the remainder of the line, which is the normal dactylo-

Schneidewin P.V. 573. τἄμπροσθ' ἢ πολύθρηνον <math>αἰῶν' ἀνατλᾶσα means that she has acquired at last (γεραιά, as ἀψιμαθήs) the different strain of πολύθρηνοs ὅμνοs, her perfection in it having been preceded by long practical experience (πάθει μαθοῦσα) of suffering fitted for lament indeed. τἄμπροσθε was restored by Heusde (who understood it somewhat differently); and ἢ, suggested by Hermann and confirmed by Paley, seems to me better here than ἡ.

<sup>26</sup> μεταμανθάνουσα δὲ ὅμνον πολύθρηνον hymenaei loco discens flebile carmen Bothe. Change from the ὑμέναιος to the θρῆνος is a theme found first in Erinna A.P. vii 712, and it became a commonplace with later writers, ib. 52, 182, 183, 186, 188, Ach. Tat. iii. 10, Heliod. ii. 29, Eur. Alc. 924-31. The point is made in our passage with such care and so impressively that it is somewhat surprising to find it has hardly been perceived: Heusde compares Bion i. 87 and

And in Ar. Thesm. 101, where Agathon with his Chorus comes on singing, this is among his soft and delicate Asiatic phrases:

107 ΑΓ. ἄγε νῦν ὅλβιζε Μοῦσα χρυσέων ῥύτορα τόξων
116 ΧΟ. ἔπομαι κλήζουσα σεμνὸν γόνον ὀλβίζουσα Λατοῦς
123 σέβομαι Λατώ τ' ἄνασσαν κίθαρίν τε ματέρ' ὕμνων

When therefore I was first attending to the metre of the 7th Olympian, the effect it suggested to my ear was an Asiatic phrase, merged presently, by overlapping, into Dorian:

# φιαλαν ώς ει τις αφνειας απο χειρος ελων

If you were to make two melodic figures, each to serve as a Leit-motiv, you might say, this shall be the Asiatic:



and this the Dorian:



Then you could combine the two, the one blending into the other, in this way:



Now if this is the true account,—if we have really an Ionic rhythm here,—there should, according to the principle laid down before, be some allusion to that rhythm in the epode. We turn, then, to the epode, and we find that it proceeds in Dorian metre till we come to the last line but one, describing Rhodes and her inhabitants:

καὶ παρὰ Κασταλία πατξρά τε Δαμάγητον αδόντα Δίκα 'Α σίας εὐρυχόρου τρίπολιν νᾶσον πέλας ἐμβόλφ ναίοντας 'Α ρ γ εία σὺν αἰχμᾶ.

There is our Ionic plainly,  $\circ \circ - - | \circ \circ -$  and  $\circ \circ - - | - \circ -$ , the second phrase repeating what we opened with,  $\phi\iota\dot{a}\lambda a\nu$   $\dot{\omega}_{S}$   $\epsilon''$   $\tau\iota_{S}$   $\dot{a}\phi\nu$ . And this Ionic comes in momentarily, for Asia; while in the next line we return to Dorian epitrite for Argos. The meaning is apparent when you think of Rhodes; the connexion of it with the mainland was particularly close, but it was colonized by Argives; and the metre indicates this double character. Thus the first line symbolizes Dorian with a tinge of Asiatic, or Asiatic overwhelmed beneath subduing Dorian.

Aristotle is a good authority, and he tells us that Sappho wrote an answer to Alcaeus: Alcaeus having said  $\theta \dot{\epsilon} \lambda \omega \tau \iota F \dot{\epsilon} \iota \pi \eta \nu$ ,  $\dot{a} \lambda \lambda \dot{a} \mu \epsilon \kappa \omega \lambda \dot{\nu} \epsilon \iota a \iota \delta \omega s$ , she replied

αὶ δ' ἢχες ἔσλων ἴμμερον ἢ κάλων καὶ μή τι Γείπην γλῶσσ' ἐκύκα κακόν, αἴδως κε σ' οὐ κίχανεν ὅππατ' ἀλλ' ἔλεγες περὶ τῶ δικαίως.

Bergk thought <sup>27</sup> that this line of Alcaeus was in the same metre and belonged to the same poem as another fragment quoted by Hephaestion, so that it should run:

ιόπλοκ' ἄγνα μελλιχόμειδε Σάπφοι θέλω τι Γείπην, ἀλλά με κωλύει αἴδως

the open syllables in κωλύει αἴδως coalescing. Be that as it may, there is no reason to doubt, and no one doubts, that the first line, an address to Sappho, was written by Alcaeus; and the metre is remarkable. Hephaestion calls it a τρίμετρον ἀκατάληκτον περιττεῦον συλλαβŷ τŷ τετάρτη, καλούμενον δὲ ᾿Αλκαϊκὸν δωδεκασύλλαβον. Those who like may make it so: 'What is it? A learned man Could give it a learned name: Let him name it who can, The beauty would be the same.' What we see is that it begins as an Alcaic but its ending is the Sapphic, and the two metres are wedded in the closest way:

carminis: Alcaeus ad Sapphonem scribens Sapphico utitur versu sed hendecasyllabon anacrusi auxit, ut numeri lenitatem propria gravitate temperaret, ac videtur hoc metrum, quod novavit, in hoc uno carmine adhibuisse. Sappho Alcaeo rescribens praeter solitum Alcaicam stropham, cuius indoles a suae poesis natura abhorrebat, adhibuit. Haec igitur singularis ars, quam in numeris deprehendimus, consilium utriusque carminis egregie illustrat Aristotelisque testimonium planissime confirmat.' The same argument weighs strongly in my mind; though the significance of the metres I interpret differently.

Opinions on the question are well summarized by Prof. H. W. Smyth Greek Melic Poets (1900) p. 239. I quote a portion of Bergk's note Poetae Lyrici Graeci III p. 99: 'Cum Aristoteles, fide si quis alius dignus, testificetur poetriam haec rescripsisse Alcaeo, apparet necessitudinem, quae inter haec carmina intercedit, manifestam fuisse: itaque non dubitavi Alcaei versui quem Aristoteles adscripsit  $\theta \acute{\epsilon} \lambda \omega$   $\tau_i$   $F \acute{\epsilon} (\pi \epsilon \nu)$  å $\lambda \lambda d$   $\mu \epsilon$   $\kappa \omega \lambda \acute{\epsilon} \iota$  albas praemittere versum eiusdem numeri quem servavit Hephaestio  $l \acute{\epsilon} \delta \pi \lambda o \kappa$ '  $\acute{\epsilon} \gamma \nu a$   $\mu \epsilon \lambda \lambda i \chi \acute{\epsilon} \mu \epsilon i \delta \epsilon$  samphonem in praegressa stropha Alcaeum nominatim compellasse. Animadversione digni etiam numeri utriusque

Alcaic ἰόπλοκ' ἄγνα μελλιχόμειδε Σάπφοι Sapphic

A poetess from whom the language of metre was not hid could easily dispense with any more; this little Valentine would tell its story quite intelligibly by itself: 'The Form, the Form alone is eloquent'!

As for Sappho's answer in Alcaics, there is no evidence that she used this metre elsewhere. If you were a woman and desired, while uttering a reproof in words, to acknowledge and return a compliment, would you write in your own proper metre or in his? For Sappho writes in his.

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Rhythm and Meter in Ancient Greek Music

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# Rhythm and Meter in Ancient Greek Music

## Thomas J. Mathiesen

The resurgence of interest in ancient Greek music in the last ten years has resulted in the publication of many important monographs and articles on musical instruments, scales, particular treatises, and musical fragments, the latter of which continue to be discovered from time to time. Yet the subject of rhythm and meter in ancient Greek music has remained almost totally unexplored by modern scholars. On the surface, this

A considerably abbreviated version of this paper was presented at the 115th annual meeting of the American Philological Association, 27–30 December 1983, in Cincinnati, Ohio. I am indebted to Ms. Nancy Sultan for presenting my paper at the meeting when I was prevented at the last moment from attending.

<sup>1</sup>There have been more than 90 major publications in this field since 1974. These, as well as some additional earlier publications, are listed in the latest supplement to my *Bibliography of Sources for the Study of Ancient Greek Music*, Music Indexes and Bibliographies, no. 10 (Hackensack, N.J.: Boonin, 1974). Copies of the supplement are available to interested persons free of charge and may be obtained by writing to me.

<sup>2</sup>The notable exceptions are François Auguste Gevaert, *Histoire et théorie de la musique de l'antiquité*, 2 vols. (Gand: Detaille, 1875–81; reprint ed., Hildesheim: Olms, 1965), who devotes considerable and often incisive attention to the matters of rhythm and meter in ancient Greek music; Rudolf Westphal, "Die Aristoxenische Rhythmuslehre," *Vierteljahrsschrift für Musikwissenschaft* 7 (1891):74–107; idem, *Aristoxenos von Tarent, Melik und Rhythmik des classischen Hellenentums*, 2 vols. (Leipzig: Abel, 1883–93; reprint ed., Hildesheim: Olms, 1965); idem, *Die Fragmente und die Lehrsätze der griechischen Rhythmiker* (Leipzig: Teubner, 1861); idem, *Griechische Rhythmik und Harmonik nebst der Geschichte der drei musischen Disziplinen* (Leipzig: Teubner, 1867); idem, *System der antiken Rhythmik* (Breslau: Leuckart, 1865); Giovanni Pighi, "Ricerche sulla notazione ritmica greca,"

will no doubt seem to be a fantastic assertion. There are, after all, numerous book-length treatments of Greek meter and countless articles dealing with particular meters or passages in Greek lyric poetry that appear to be metrically troublesome. Nevertheless, these studies (1) do not deal with the actual musical fragments; (2) are based on analyses of published editions deriving from a manuscript tradition that by the second century B.C. had already altered the rhythmic character of the original poetry to conform to certain notions of Greek meter and that by all accounts was altered many times over the succeeding centuries;3 (3) assume that Greek verse was conceived by its composers or heard by its audience as a series of meters rather than a flexible and varying rhythmic pattern; (4) make no differentiation between rhythm and meter; and (5) almost uniformly ignore the testimony of the ancient and early treatises, which present a view of rhythm and meter quite at variance with mod-

Aegyptus 21 (1941):189-220, 23 (1943):169-243, and 39 (1959):280-89; Lewis Rowell, "Aristoxenus on Rhythm," Journal of Music Theory 23 (1979):63-79; and Thrasybulos Georgiades, Musik und Rhythmus bei den Griechen (Hamburg: Rowohlt, 1958). The work of Westphal is best known to classicists, who have largely rejected his conclusions. While many of Westphal's conclusions are extreme or misguided, his work contains many insights and can be read with profit.

<sup>&</sup>lt;sup>3</sup>These alterations can be seen clearly by comparing the manuscript tradition and the papyrus fragment for lines 783-93 of Euripides' *Iphigenia in Aulis*. For a full study of this fragment, see my "New Fragments of Ancient Greek Music," *Acta musicologica* 53 (1981):14-32.

ern studies of metrics. <sup>4</sup> A few examples of this last point may be informative:

Ancient metrical theory offers nothing but superficial description, mechanical classification, and unprofitable speculation. Only a few of the technical terms it used are of value today, and the most useful are those which make no claim to express an essential characteristic of the thing described. With the possible exception of Damon, who was one of Pericles' teachers . . . , no Greek writer of any importance seems to have concerned himself with metric.<sup>5</sup>

The ancient metricians, of whom Hephaestion . . . is the chief, do not help us greatly towards an understanding of Greek metric, and it is unlikely that they represent a tradition dating back to the classical period.<sup>6</sup>

Passing references in ancient metrical theory are of no great importance to the argument either way; neither the affirmative of Aristides Quintilianus and Marius Victorinus nor the denial of Hephaestion and his commentators need influence us.<sup>7</sup>

It seems clear, therefore, that reliance on modern treatments of metrics will not provide illumination of the function of rhythm

<sup>4</sup>Earlier scholars were not so quick to dismiss the testimony of the theorists. In addition to the works cited in n. 2, one might note Maximilian Consbruch, De veterum ΠΕΡΙ ΠΟΙΗΜΑΤΟΣ doctrina, Breslauer philologische Abhandlungen, V/3 (Breslau: Koebner, 1890); Georg Amsel, De vi atque indole rhythmorum quid veteres iudicaverint, Breslauer philologische Untersuchungen, I/3 (Breslau: Koebner, 1887); Charles Thurot, "De l'emploi des mots θΕΣΕΙ, positione," Revue de philologie 4 (1880):92–97; and Hermann Wiegandt, "De ethico antiquorum rhythmorum charactere auctore Aristide Quintiliano" (Ph.D. diss., Halle, 1881).

<sup>5</sup>Paul Maas, *Greek Metre*, trans. Hugh Lloyd-Jones (Oxford: Clarendon, 1962), p. 5.

<sup>6</sup>J. D. Denniston, "Metre, Greek," in *The Oxford Classical Dictionary*, 2d ed. by N. G. L. Hammond and H. H. Scullard (Oxford: Clarendon, 1970), p. 670

<sup>7</sup>A. M. Dale, *The Lyric Metres of Greek Drama*, 2d ed. (Cambridge: Cambridge University Press, 1968), p. 34, n. 1.

and meter in ancient Greek music or—given the inextricable relationship of the melos, rhythm, and text8—in Greek lyric poetry in general. As an alternative, this study will draw together a number of theoretical passages, articulate some general observations about the difference between rhythm and meter and the way in which they work together, and illustrate the rhythmic construction of the two earliest surviving fragments (both from plays of Euripides) as well as several later pieces.

#### Concepts of Rhythm and Meter

With a few exceptions, the ancient theorists mark a clear distinction between rhythm and meter and are consistent in their conception of rhythm. One of the exceptions, as might be anticipated, is Aristoxenus, who speaks only of rhythm. His treatment survives in two fragments: the so-called *Rhythmic Elements*, which is transmitted in a number of manuscripts; and another part of this (most probably), which is preserved in Oxyrhynchus Papyrus (*P. Oxy.*) 9. Aristoxenus' *floruit* in the fourth century B.C. makes him a particularly important witness on the subject of rhythmics (as he is on the subject of harmonics), and the fact that there are no apparent contradictions between Aristoxenus and later authors such as Hephaestion and his commentators, Dionysius of Halicarnassus, Aristides Quintilianus, Plutarch, Augustine, and Bacchius supports their relia-

<sup>8</sup>Cf. Aristides Quintilianus De musica 1.12.

<sup>9</sup>The possibility that a discussion of metrics appeared in a treatise now lost cannot be rejected. A fragment dealing with metrics and ascribed to Aristoxenus is preserved in Psellus 1 (see Westphal, *Aristoxenos*, 2:76).

<sup>10</sup>For editions, see Westphal, Aristoxenos, 2:75-85; and Heinrich Feussner, Aristoxenus, Grundzüge der Rhythmik, ein Bruchstück, in berichtigter Urschrift mit deutscher Übersetzung (Hanau: Edler, 1840). P.Oxy. 9 appears in The Oxyrhynchus Papyri 1 (1898): 14-21 and plate 3. A valuable translation of the largest fragment appears in Rowell, "Aristoxenus," pp. 70-76.

bility as representatives of an ancient tradition, though separated from it by four to six centuries.

Aristoxenus defines rhythm in his characteristically precise manner. He differentiates between rhythm (an abstract essence) and a thing rhythmically organized (a concrete manifestation of the abstract):

- 3. One must first understand that there are two certain natures: that of rhythm and the rhythmicized substance, closely related to one another just as the form [  $\sigma\chi\eta\mu\alpha$ ] and that which is formed [  $\sigma\chi\eta\mu\alpha\tau\iota\zeta$ 6- $\mu\epsilon\nuo\nu$ ] are related.
- 4. For just as the body takes on many sorts of shapes whenever its parts are placed in different ways (either some or all of them), in like manner each of the rhythmicized substances takes on many forms, not in accordance with its own nature but in accordance with the nature of rhythm. For speech, which is likewise arranged into time units differing one from another, takes on certain divisions which correspond to the divisions produced by the natural order of rhythm. And the same principle obtains with respect to *melos* and anything else that is organized rhythmically by means of this rhythm that is composed of time units.
- 5. To continue with the previous analogy, we must now consider the subject of sense perception in our attempt to discern—in the case of each of the previous topics—what is the essential nature of rhythm and of the rhythmicized substance. For to have form imposed on the body is by no means the same thing as any of the forms themselves; on the contrary, the form is a certain disposition of the parts of the body, from whence each individual form somehow arises and is recognized as such. Similarly it must be conceded that the rhythm is by no means the same as the rhythmicized substance, nor is this substance identical to the arrangements of time units made in one way or another. 11

So, rhythm is, as Lewis Rowell observes in his translation of the *Rhythmic Elements*, "a dynamic species of form, signifying the

internal structure of a moving thing—ordered movement, movement in accordance with certain principles of structure."12

This comprehensive ontological view is considerably simplified by Aristides Quintilianus (fl. late third or early fourth century A.D.) in his *On Music*, the most complete of the ancient musical treatises. He writes:

Rhythm is a scale of chronoi<sup>13</sup> compounded according to some order, and the conditions of these we call arsis and thesis, noise and quietude. Since, in general, notes, by a similarity of motion, make an inexpressive succession of melos and lead the heart astray, the parts of rhythm palpably compose the power of the melody, moving the heart now by turns, now regularly. Arsis is the movement upwards of part of a body; thesis, the movement downwards of the same part. Rhythmics is the science of the use of the aforesaid things.<sup>14</sup>

Rhythm will therefore exist in pure diction, in pure melos (or, what might be loosely considered a melodic line without text), in pure dance, or in a combination of these. The science of rhythm, or rhythmics (parallel to harmonics in ancient Greek music theory), is separated into five parts: chronoi protoi, <sup>15</sup> the

<sup>12</sup>Rowell, "Aristoxenus," p. 68. Rowell's emphasis on structure accords with the interpretation of Robert Renehan, "The Derivation of  $\dot{\varrho}\upsilon\theta\mu\dot{\varrho}\varsigma$ ," Classical Philology 58 (1963): 36–38. For a fuller treatment of the term, see Ernst Wolf, "Zur Etymologie von  $\dot{\varrho}\upsilon\theta\mu\dot{\varrho}\varsigma$  und seiner Bedeutung in der älteren griechischen Literatur," Wiener Studien 68 (1955):99–119.

<sup>13</sup>The chronos (pl.: chronoi) is the measure of time in rhythm. It may be a single short rhythmic duration (the "chronos protos")—that of a short syllable—or it may be doubled, tripled, or quadrupled to produce rhythmic groupings.

<sup>14</sup>Aristides Quintilianus *De musica* 1.13 (trans. from Thomas J. Mathiesen, *Aristides Quintilianus on Music in Three Books: Translation, with Introduction, Commentary, and Annotations, Music Theory Translation Series* [New Haven: Yale University Press, 1983], p. 94). Unless otherwise noted, translations throughout this study are mine.

<sup>15</sup>This is defined by Aristides Quintilianus (1.14) as "an uncompounded and smallest chronos, which is also called a point. I shall call that chronos small-

<sup>&</sup>lt;sup>11</sup>Aristoxenus Rhythmica 3-5 (trans. from Rowell, "Aristoxenus," p. 71).

genera of metric feet, tempo, modulation, and rhythmic composition. <sup>16</sup>

Bacchius (fl. fourth century A.D.), the author of a very useful musical catechism preserving fragments from earlier treatises now lost, responds to the question "What is rhythm?" with a series of definitions ascribed to various early authorities:

(a) a measuring of chronos when there is a certain sort of movement;<sup>17</sup> (b) according to Phaedrus,<sup>18</sup> rhythm is the measured setting of syllables placed one to another in a certain way; (c) according to Aristoxenus, [rhythm is] chronos divided with a view to each of the things that can be rhythmically organized;<sup>19</sup> (d) according to Nicomachus, [it is] orderly motion of chronoi;<sup>20</sup> (e) according to Leophantus, [it is] a composition of chronoi considered in proportion and symmetry to each other;<sup>21</sup> and (f) according to Didymus, [it is] a configuration of a certain sound—sound configured in a certain way makes rhythm, and rhythm arises either in diction or melos or bodily motion.<sup>22</sup>

Meter, on the other hand, is different from rhythm. Aristides Quintilianus, who treats meter only after completing his discussion of rhythm, notes in Book I, section 23 that meter is a division of rhythm and uses different material. He states:

Meter is a scale of feet compounded of dissimilar syllables, symmetrical in length. Some say that meter differs from rhythm as the part from the whole (they say that it is a division of rhythm, for which reason it is termed "meter," from "meirein," which means "to partition"); others say that it differs with respect to the material: since they are born of at least two dissimilar progenitors, rhythm has its essence in arsis and thesis, and meter in syllables and their dissimilarity. So in truth, rhythm is composed through similar syllables and opposing feet, but meter is never composed through having all syllables similar and seldom through opposing feet.<sup>23</sup>

Longinus' (fl. third century A.D.) commentary on Hephaestion's (fl. second century A.D.) *Handbook* observes: "the father of meter is rhythm and god, for meter began from rhythm and god called forth meter."<sup>24</sup> Choeroboscus' (fl. eighth century A.D.) commentary phrases it a bit differently: "the father and source of the meters is rhythm."<sup>25</sup>

A number of additional and comparable definitions could be adduced, but it is already clear from these that meter or metrics is on the one hand a tool by which a pattern of rhythmic chronoi might be determined and on the other hand a means of measuring quantity in syllables. These two functions are related in a way, as will become apparent. It is likewise clear that rhythm is a scale of chronoi involving arsis and thesis (the sense of these terms will be developed below) in differing tempi, meters, and forms brought about by modulation. The matters of rhythmic

est, as far as we are concerned, which is the first to be grasped by sensory perception" (Mathiesen, Aristides, p. 95).

<sup>&</sup>lt;sup>16</sup>Aristides Quintilianus De musica 1.13.

<sup>&</sup>lt;sup>17</sup>In the text, I am following the readings of Venetus Marcianus app. cl. VI/3 instead of the emended text as it appears in Karl von Jan, *Musici scriptores graeci* (Leipzig: Teubner, 1895; reprint ed., Hildesheim: Olms, 1962), p. 313. Cf. Charles-Emile Ruelle, *Alypius et Gaudence*, . . . *Bacchius l'Ancien, traduction entièrement nouvelle*, Collection des auteurs grecs relatifs à la musique, no. 5 (Paris: Firmin-Didot, 1895), p. 134.

<sup>&</sup>lt;sup>18</sup>Possibly the fabulist (ca. 15 B.C.-A.D.50), but it is impossible to be certain.
<sup>19</sup>Aristoxenus Rhythmica 9 actually states: "chronos is divided by the things rhythmically organized with respect to the parts of each of them."

<sup>&</sup>lt;sup>20</sup>This does not appear in any of the surviving works of Nicomachus (fl. 2d century A.D.).

<sup>&</sup>lt;sup>21</sup>Leophantus is otherwise unknown.

<sup>&</sup>lt;sup>22</sup>This Didymus (1st century B.C.) may be the same one known to Ptolemy. Aristoxenus *Rhythmica* 9 identifies three things rhythmically organized: diction, melos, and bodily motion. Aristides Quintilianus *De musica* 1.13 states: "In music, motion of body, melody, and diction are rhythmically organized" (Mathiesen, *Aristides*, p. 94). The entire passage from Bacchius appears in Jan, *Musici scriptores*, p. 313.

<sup>&</sup>lt;sup>23</sup>Mathiesen, Aristides, pp. 107-8.

<sup>&</sup>lt;sup>24</sup>Longinus Prol. Heph. 1.1 (Consbruch 81.10-11).

<sup>&</sup>lt;sup>25</sup>Choeroboscus *Scholia in Heph.* 1.1 (Consbruch 177.12). On the difference between rhythm and meter, cf. Longinus *Prol. Heph.* 1.4 (Consbruch 83.1–25) and Choeroboscus *Scholia in Heph.* 1.1 (Consbruch 179.1–180.15).

tempi, modulation, and composition in general are discussed by Aristides Quintilianus in Book I, section 19 of his treatise.

One of the most important surviving treatises on poetic theory is Dionysius of Halicarnassus' (fl. first century B.C.) On Literary Composition, which together with Hephaestion's Handbook may have been the source for much of Aristides Quintilianus' material on rhythm and meter. Dionysius of Halicarnassus' definitions are perfectly in line with those noted above, but his treatment is more detailed and reveals clearly the primacy of rhythm. In section 11, he comments that the natural metric quantity of syllables<sup>26</sup> is often altered by music and rhythm, "so that they often pass into their opposites: the chronoi are not regulated by the syllables, but the syllables by the chronoi."27 Augustine's treatise On Music, Book II, section 1, confirms this point, but of greater importance is the fact that the earliest fragments of ancient Greek music, both dating from the third century B.C., exhibit this power of rhythm and music, as will be demonstrated later in this study. Dionysius offers further clarification on the quantity of syllables in section 15 of his treatise: "There is not one nature of long and short syllables, rather some are longer than longs and some shorter than shorts."28 This statement is followed by a number of examples in which syllables are shown to be of varying length depending on the number of elements.<sup>29</sup> Dionysius' observations are confirmed in the discussion of elements in Aristides Ouintilianus' Book I, section 21. Section 15 of Dionysius' treatise concludes with the observation that "every short syllable and every long syllable do not have the same function in pure prose or in poems or in melos, whether constructed in meters or rhythms."30 Section 17 elaborates on these matters through a series of excerpts subjected to analysis.

In the last parts of *On Literary Composition* (sections 25–26), Dionysius provides extensive treatments of the way in which prose may be made to resemble verse and verse to resemble prose. In both cases, it is a manipulation of the rhythm that accomplishes the end. Dionysius gives examples from the works of Plato, Demosthenes, Homer, Euripides, and others to demonstrate his points.<sup>31</sup>

In order to understand the important matter of the metric quantity of syllables, which is so crucial to an understanding of rhythmic function, it is now necessary to interject an *excursus* on the elements. Book I, sections 20–21 of Aristides Quintilianus' treatise provides a clear and useful summary, and it will be the basis for the following treatment.

All the letters of the Greek alphabet can be classed as vowels, semivowels, and mutes. The vowels are alpha, epsilon, eta, iota, omicron, upsilon, and omega  $(\alpha, \epsilon, \eta, \iota, o, \upsilon, \omega)$ . Some of these are classed as short (i.e., equal to the smallest chronos): epsilon and omicron; some as long (i.e., requiring a longer chronos³²): eta and omega; and some are dichronic (i.e., "ambiguous in chronos"): alpha, iota, and upsilon. The semivowels are zeta, lambda, mu, nu, xi, rho, sigma, and psi  $(\xi, \lambda, \mu, \nu, \xi, \varrho, \sigma, \text{ and } \psi)$ . Some of these are called double consonants (be-

<sup>&</sup>lt;sup>26</sup>One of the functions of meter, it will be recalled, is to measure the nature of syllables.

<sup>&</sup>lt;sup>27</sup>Dionysius of Halicarnassus De comp. verb. 11 (Roberts 128.19-130.2).

<sup>&</sup>lt;sup>28</sup>Dionysius of Halicarnassus De comp. verb. 15 (Roberts 150.22–152.2).

<sup>&</sup>lt;sup>29</sup>"Elements" are similar to what are now called phonemes.

<sup>&</sup>lt;sup>30</sup>Dionysius of Halicarnassus De comp. verb. 15 (Roberts 154.1-3).

<sup>&</sup>lt;sup>31</sup>An excellent translation of the treatise of Dionysius of Halicarnassus, with copious annotations, is W. Rhys Roberts, *Dionysius of Halicarnassus on Literary Composition* (London: Macmillan, 1910; reprint ed., New York: AMS Press, 1976). Without detailing them, I note that the same sorts of definitions of rhythm, meter, and their various parts are found in later treatises, such as those by Sergius (Keil, *Grammatici Latini* [GL], 4:533), Marius Victorinus (GL 6:40–43, 50–53), Maximus Victorinus (GL 6:206–7), Atilius Fortunatianus (GL 6:282), Audax (GL 7:331–32), Cassiodorus *Institutiones* 5.5, and Quintilian *Institutio oratoria* 9.4.

<sup>&</sup>lt;sup>32</sup>Note that Aristides Quintilianus does *not* say that the long vowels are twice the length of the short vowels, yet this is commonly asserted to be the case by modern metricians.

cause they require two sounds): zeta, xi, and psi; some are called liquids (because they blend with other sounds and are therefore equal to less than one consonant): lambda, mu, nu, and rho; and one is called a spirant: sigma. Finally, the mutes are beta, gamma, delta, theta, kappa, pi, tau, phi, and chi ( $\beta$ ,  $\gamma$ ,  $\delta$ ,  $\vartheta$ ,  $\kappa$ ,  $\pi$ ,  $\tau$ ,  $\varphi$ ,  $\chi$ ). The mutes are further subdivided into rough (theta, phi, and chi), smooth (kappa, pi, and tau), and medial (beta, gamma, and delta); or labial (beta, pi, and phi), dental (delta, theta, and tau), and palatal (gamma, kappa, and chi).

The combination of these letters produces syllables, which are measured (or, metered) by their vowels or by certain combinations of semivowels and mutes. Long syllables are those with (1) a long vowel, (2) a lengthened dichronon, <sup>33</sup> (3) a short vowel and a dichronon, (4) two dichrona, or (5) any vowel followed by two semivowels or one double consonant (with certain exceptions involving mutes and liquids), whether or not these are in the same syllable. The first four types are called "long by nature" because the vowels themselves provide length; the fifth type is called "long by position" because the length is provided by the position of the semivowels in relation to the vowels. Short syllables are those with (1) a short vowel or (2) a shortened dichronon, provided these stand alone or are followed by only a simple semivowel.

Aristides Quintilianus observes in connection with these that there are certain relationships between short and long syllables and that the consonants themselves have a certain length:

It has been demonstrated that the magnitudes of the elements are equal in number to the intervals of the tone, for the smallest of these is a fourth part of the largest—as the diesis is of the tone, and the intermediate is half of the larger and double the smaller. A short syllable is half of a long and a simple consonant is half of a short; it is evident that from the juxtaposing of either a double consonant or one vowel, a short becomes a long.<sup>34</sup>

He then points out that there are also common syllables, which are so called because "sometimes short, sometimes long, they fulfill the need." Syllables that are long by nature become common when the syllable terminates in a long vowel and (1) is followed by another syllable in the same word that begins with a vowel or (2) is followed by a syllable in the succeeding word that begins with a vowel. Syllables that are short by nature become common when the syllable terminates a word, either because the interval between words causes the short syllable to seem a bit longer or, when the next word begins with an aspirated vowel, because the aspiration prevents the short syllable from being absorbed into the following vowel. Syllables that are long by position become common when the two semivowels are a mute and a liquid. Syllables are a mute and a liquid.

Dionysius of Halicarnassus provides some examples of the complexity of metering syllables in section 15 of his treatise. In the word στρόφος, the short first syllable is seen as longer than the short first syllable in ὁδός because the vowel is preceded by two semivowels and a mute. Likewise, the long syllable  $\sigma\pi\lambda\dot{\eta}\nu$  would be longer than the syllable  $\dot{\eta}\nu$ . The first syllable of  $\dot{\varrho}\delta\delta$  is longer than the first syllable of  $\dot{\varrho}\delta\delta$ , the first syllable of  $\tau\dot{\varrho}\delta\sigma$ , is longer than the first syllable of  $\dot{\varrho}\delta\delta\sigma$ , and the first syllable of  $\tau\dot{\varrho}\delta\sigma\sigma$ , as longer than the first syllable of  $\tau\dot{\varrho}\delta\sigma\sigma$ . As he concludes, "So, there are four different types of short syllables, which have only irrational sense as a measure of their variation."<sup>39</sup>

35 Ibid.

 $^{36}\mbox{The}$  second vowel tends to take some of the length of the first as the voice blends the sounds.

<sup>37</sup>In this case, both vowels are more clearly sounded to distinguish the two words.

<sup>38</sup>Because these are weak sounds, they do not add enough length to the syllable to make it fully long. If the liquid is a mu, however, the syllable is a little longer because the mu adds length by requiring the lips to fully close in order to produce the "m" sound. If the mu is fully sounded, the syllable will be long. On the matter of the mu, see Aristides Quintilianus *De musica* 1.21.

<sup>39</sup>Dionysius of Halicarnassus *De comp. verb.* 1.15 (Roberts 152.14–15).

<sup>&</sup>lt;sup>33</sup>Some of these will appear in the fragments analyzed later in this paper.

<sup>&</sup>lt;sup>34</sup>Aristides Quintilianus *De musica* 1.21 (Mathiesen, *Aristides*, p. 104).

It should now be clear that a syllable in Greek verse will be not only long or short but also common and that all these syllables are variable in length. Thus, to recall Dionysius' words once again: "There is not one nature of long and short syllables, rather some are longer than longs and some shorter than shorts." This variety will appear most clearly in the musical fragments to be discussed later.

#### Arsis and Thesis

A basic distinction between rhythm and meter, as noted above, is stated by Aristides Quintilianus in Book I, section 23: "Rhythm has its essence in arsis and thesis, and meter in syllables and their dissimilarity." <sup>41</sup> If the essence of rhythm is arsis and thesis, it is clear that these terms must be properly understood in order to form a conception of ancient Greek rhythm; nevertheless, the terms are casually dismissed by modern metric studies. Paul Maas, for instance, states:

The present exposition has the limited aim of describing the most important phenomena with as few preconceptions as possible. It will therefore be necessary not only to avoid using the terms "arsis" and "thesis," but to keep our minds clear, so far as possible, of the notions associated with them. This is so for the following reasons:

- 1. In English rhythmic "arsis" and "thesis" signify the stressed and unstressed syllables respectively, a distinction which does not exist in Greek metric.
- 2. The Greek metrical writers (e.g., Bacchius §§ 98-101, p. 317 von Jan) mean by "arsis" what we, who tend to confuse "short" with "unaccented," mean by "thesis" and by "thesis" what we mean by "arsis."
- 3. Even in their original sense these terms are useless, because they make a unit not of the organic groups of elements but of parts of these arbitrarily separated from the wholes. These parts are the so-called "feet"  $(\pi\delta\delta\epsilon\xi, \chi\tilde{\omega}\varrho\alpha\iota)$ .

4. Most important of all, we are in any case obliged to give names to the elements and groups of elements that we learn to recognize through the principle of responsion . . .; and this makes the concepts of "arsis" and "thesis" superfluous. $^{42}$ 

Maas's arguments are, of course, either irrelevant (1 and 2) or a priori (3 and 4). Perhaps it will be possible to show that the notions associated with arsis and thesis are indeed valuable to an understanding of ancient Greek rhythmics.

Aristides Quintilianus, once again, provides useful comment on the nature of arsis and thesis. In Book I, section 13, he makes it clear that arsis and thesis are "conditions" of the chronoi that make up rhythm. Later, in section 14, he points out that arsis and thesis are the two parts of a foot. Then, in sections 15 through 17, he defines many feet in terms of their arses and theses, and it becomes clear that feet of similar quantity will be distinguished by which part is the arsis and which the thesis. For example, in comparing the greater anapestic, lesser anapestic, iamboid choreic, and trochoid choreic, it may be seen that the first has a long thesis and an arsis of two shorts; the second is the exact reverse—an arsis of two shorts and a long thesis; the third, which in order of chronoi is identical to the greater anapestic, is defined as having a long arsis and two theses; and the fourth, which in order of chronoi is identical to the lesser anapestic, is defined as having two arses and a long thesis. Figure 1 exhibits these patterns. Even without determining precisely what arsis and thesis mean, it is clear that the difference between greater and lesser anapestic is not the arsis and thesis, but rather the order of the arsis and thesis; that the difference between greater anapestic and iamboid choreic is not in the chronoi, but in the order and number of the arsis and thesis; that the difference between lesser anapestic and trochoid choreic is not in the chronoi, but in the number of arses and theses; and that the difference between iamboid choreic and trochoid choreic is not in the order of arsis and thesis, but in the number of arses and theses.

<sup>&</sup>lt;sup>40</sup>Ibid. (Roberts 150.22-152.2).

<sup>&</sup>lt;sup>41</sup>Aristides Quintilianus *De musica* 1.23 (Mathiesen, *Aristides*, p. 108).

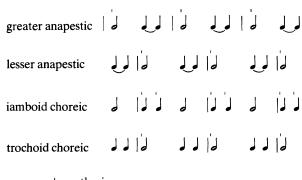
<sup>&</sup>lt;sup>42</sup>Maas, Greek Metre, pp. 6-7.

Figure 1. Comparison of greater and lesser anapestic, iamboid and trochoid choreic (following Aristides Quintilianus *De mus.* 1.15, 17)

	thesis	arsis
greater anapestic		UU
	arsis	thesis
lesser anapestic	$\cup$ $\cup$	
	arsis	2 theses
iamboid choreic		UU
	2 arses	thesis
trochoid choreic	$\cup$	

It may be informative to see how these distinctions could be represented through the analogy of modern rhythmic notation. Figure 2 shows the notational patterns for the four rhythms, and the subtle differences should be immediately apparent. The

Figure 2. Rhythmic patterns in musical notation for the greater and lesser anapestic and the iamboid and trochoid choreic



thesis

two chronoi
in one position

greater and lesser anapestic, which come from the dactylic genus,<sup>43</sup> are equal rhythms because the arsis and thesis are equal; the iamboid and trochoid choreic are, however, like the dactylic genus in rhythm (as is apparent) but like the iambic genus in number because there are two theses or arses to one arsis or thesis. The way in which rhythms may differ one from another in respect to their arses and theses is an important distinctive factor, as is made clear in Aristoxenus' *Rhythmic Elements*:

Feet differ from one another in antithesis, some having the time of arsis in opposition to that of the thesis. This same difference will also exist in those feet equal in duration yet unequal in the placement of the arsis against the thesis;<sup>44</sup>

and in Aristides Quintilianus' Book I, section 14:

"Foot" is a part of every rhythm, through which we comprehend the whole. There are two parts to this: arsis and thesis. There are seven differences of feet: . . . The seventh difference is that by antithesis, as whenever, with two feet, the one has the larger chronos leading and the smaller following and the other is the opposite. 45

The significance of arsis and thesis to rhythmic design is evident, but how were they conveyed to the audience? In this area, the theorists are unfortunately largely silent. Aristides Quintilianus in Book I, section 13 refers to arsis and thesis as "noise and quietude," and it is possible this refers to the clapping sound of the *kroupala* worn by the *koryphaios*. <sup>46</sup> This possibility is supported to some degree by Augustine's *On Music*,

<sup>&</sup>lt;sup>43</sup>Aristides Quintilianus De musica 1.15.

<sup>&</sup>lt;sup>44</sup>Aristoxenus Rhythmica 29 (Rowell, "Aristoxenus," p. 75).

<sup>&</sup>lt;sup>45</sup>Aristides Quintilianus De musica 1.14 (Mathiesen, Aristides, p. 96).

<sup>&</sup>lt;sup>46</sup>See Curt Sachs, *Rhythm and Tempo: A Study in Music History* (New York: Norton, 1953), p. 140. Sachs's entire chap. 7, "Greece and Rome," contains a wealth of remarkable insights on rhythm and meter in ancient Greek music. His sections on the difference between metricists and rhythmicists and on stress (pp. 138–43) are particularly noteworthy, even when his conclusions are not entirely convincing.

Book II, section 10: "In making a beat, since the hand is raised and lowered, the arsis claims one part of the foot, the thesis the other"; and Book III, section 1:

And so first I ask you whether those feet which can properly be put together can be combined to create a sort of continuing number without definite end, as when chorus-boys beat castanets and cymbals [scabella et cymbala] with their feet according to numbers whose combinations are pleasing to the ear, but yet in an unending flow so that, unless you should hear the flutes [tibias], you could in no way mark how far the combination of feet runs forward and from where it returns to begin again.<sup>47</sup>

Aristides Quintilianus observes in Book II, section 4 that the trainer of the ancient choruses is the science of rhythmic, and this—taken together with his definition of arsis and thesis as noise and quietude—might well suggest some sort of clapping sound. Marius Victorinus also mentions the "sound" of arsis and thesis:

Arsis and thesis of which the Greeks speak—that is, *sublatio* and *positio*—signify a motion of the foot. Arsis is the raising [*sublatio*] of the foot without a sound, and thesis is the placement [*positio*] of the foot with a sound. Arsis is a lengthening of the chronos [*tempus*], sound, and voice; thesis is the lowering and a certain contraction of syllables.<sup>48</sup>

It is also possible that the arsis and thesis are directly related to particular bodily movements associated with particular rhythms, which are well attested (though not fully described) by

<sup>47</sup>Augustine *De musica* 2.10, 3.1 (trans. from Robert Catesby Taliaferro, "On Music," in *The Fathers of the Church* [New York: Fathers of the Church, 1947], 4:226, 237). Taliaferro provides a useful introduction to his translation and many informative annotations. For a text with Italian translation, useful annotations, and a valuable index, see Giovanni Marzi, *Aurelii Augustini de musica*, Collana di classici della filosofia cristiana, no. 1 (Florence: Sansoni, 1969).

many early writers, including Aristides Quintilianus in Book I, section 13, and Book II, sections 4, 10, and 16; and Quintilian's *Oratorical Principles*, Book XI, section 3 (which provides an extensive treatment of the actions used in delivery). Any of these possibilities could convey the distinction of arsis and thesis and clarify the meaning and structure of rhythmic patterns.

It is now time to make some summary statements about rhythm and meter. Rhythm is a pattern of durations (or, chronoi) articulated by arses and theses and exhibiting in generic terms certain proportions of short, long, and common syllables, which are in actual practice made shorter or longer by musical or rhythmic forces (or by both combined). Meter, on the other hand, provides (1) a means of measuring certain grammatical elements, 49 (2) a means of measuring syllables in words, which are quite variable, and (3) a means of measuring—as Aristides Quintilianus states in Book I, section 12—"feet compounded of dissimilar syllables, symmetrical in length." Whereas a rhythmic pattern may be endlessly varied, as Augustine shows in Book III of his treatise, a metric pattern must be made up of symmetrical feet (but not necessarily of the same feet), as is shown clearly in Dionysius' treatise, section 25, Aristides Ouintilianus' Book I, sections 24-29, and Augustine's Book III, section 1. So, every meter must have rhythm, but not every rhythm must have meter. Finally, verse or poetry is a scale of meters, but not necessarily the same meter, as Aristides Quintilianus observes in Book I, section 29 and Augustine in Book V. Here again, a modern parallel may be informative. Figure 3 exhibits the famous and much-noted rhythmic cycle in the four movements of Beethoven's Symphony no. 5: though the rhythm is the same in each case, the meter and tempo are different and thus the effect of each rhythmic-metric complex. So too the rhythmic-metric interplay (not simply the meter or the rhythm alone) in Greek verse is one of the main centers for expression, as will become clear in the following analyses.

<sup>&</sup>lt;sup>48</sup>Marius Victorinus Ars grammatica (GL 6:40).

<sup>&</sup>lt;sup>49</sup>Cf. Longinus *Prol. in Heph.* 4 (Consbruch 83.1–25).

Figure 3. Rhythmic-metric patterns for the four movements of Beethoven's Symphony no. 5



### Rests

Before proceeding to an examination of the two Euripidean fragments and other pieces of ancient Greek music, the function of rests in rhythm and meter should be addressed. It is perfectly clear that rests formed a part of the rhythmic and metric patterns. Aristides Quintilianus refers to rests twice in his treatise:

Moreover, they render some [patterns] of all shorts, some from longs, and some as a mixture; or by expanding the longs and the shorts, they make the arses correspond to the theses either through similar or dissimilar chronoi, and they employ some complete and some with leimmata and prostheses, in which are rests. A rest is a chronos without a note equal to the full value of the rhythm; a leimma—in rhythm—is the smallest rest and a prosthesis is a long rest, double the smallest.<sup>50</sup>

Later, in connection with the characters of rhythmic patterns, he states:

Those having complete feet in periods are more naturally suited; those having short rests are more artless and petty, and those having longish rests are more magnificent.<sup>51</sup>

Augustine adds a great deal of additional information in Book III, sections 7-8, and Book IV, sections 1-3, 7-8, and 10-17. For instance:

Then you must hold there are fixed rest-intervals in meters. And so when you have found some defect in a regular foot, you ought to consider whether there will be compensation when the rest has been measured and accounted for.<sup>52</sup>

### And again:

I think you now certainly understand there are a great many kinds of meter. In fact, we found there were five hundred and sixty-eight, when no examples were given of rests except the final ones, and no mixture of feet made, and no resolution of long syllables into two shorts stretching the foot to more than four syllables. But, if you wish to get the number of meters with every possible insertion of rests applied, and every combination of feet, and every resolution of long syllables, the number is so great its name is perhaps not at hand.<sup>53</sup>

In distinguishing the differences between rhythm and meter, Quintilian observes that rests play a role:

There are also the following differences, that rhythm has unlimited space over which it may range, whereas the spaces of metre are

<sup>&</sup>lt;sup>50</sup>Aristides Quintilianus De musica 1.18 (Mathiesen, Aristides, p. 101).

<sup>&</sup>lt;sup>51</sup>Aristides Quintilianus *De musica* 2.15 (Mathiesen, *Aristides*, p. 146). Since rests represent an absence, their measurement raised certain philosophical difficulties; the difficulty of justifying duration in vacancy can still be clearly seen in the tortuous definitions of rests that abound in thirteenth- and fourteenth-century mensural theory.

<sup>&</sup>lt;sup>52</sup>Augustine *De musica* 3.8 (Taliaferro, 4:255). The ensuing sections provide a detailed analysis of the rest functioning in a variety of metric patterns.

<sup>&</sup>lt;sup>53</sup>Augustine *De musica* 4.17 (Taliaferro, 4:296).

confined, and that, whereas metre has certain definite cadences, rhythm may run on as it commenced until it reaches the point of  $\mu\epsilon\tau\alpha$ - $\beta$ o $\lambda$  $\dot{\eta}$ , or transition to another type of rhythm: further metre is concerned with words alone, while rhythm extends also to the motion of the body. Again rhythm more readily admits of *rests* although they are found in metre as well. <sup>54</sup>

Finally and of greatest importance, rests appear in the musical fragments. Sometimes the rests are indicated by textual *stigmai* (dots), sometimes they are the result of an instrumental interjection.

Despite this evidence, rests are virtually never discussed in modern metric studies. There are a few exceptions. Lionel Pearson emphasizes the function of rests in his article "The Dynamics of Pindar's Music":

In every strophe there must be one or more places where the singer is given time to take a breath without disturbing the rhythm, where he has a rest (the equivalent of a *longum* or a *breve*, sometimes even longer), during which the instruments will not necessarily be silent or the dancers at a standstill; and generally it is not difficult to see where these rests are (they need not be the same in each strophe).<sup>55</sup>

Curt Sachs, thirty years ago, also noted the line-end rest in his *Rhythm and Tempo:* 

The end of a line could be made more definitive, masculine, and even solemn by dropping the last syllable or the last two syllables (or, rather, by replacing them with an equivalent rest) in order to conclude on a long syllable. . . . . <sup>56</sup>

<sup>54</sup>Quintilian *Institutio oratoria* 9.4.50–51 (trans. from H. E. Butler, *The Institutio oratoria of Quintilian*, 4 vols., Loeb Classical Library, nos. 105–8 [Cambridge: Harvard University Press, 1921], 3:535).

<sup>55</sup>Lionel Pearson, "The Dynamics of Pindar's Music: Ninth Nemean and Third Olympian," *Illinois Classical Studies* 2 (1977):55. Prof. Pearson remarks on the general disregard for rests in studies of Greek lyric and observes (p. 55, n. 2): "Although critics, in restoring the text, have considered difficulties of tonality . . ., they seem prepared to treat the singers as having 'lungs of bronze.' "

<sup>56</sup>Sachs, Rhythm and Tempo, pp. 133-34.

Rests were needed, of course, for purposes of breathing, but they also helped articulate rhythmic and metric patterns, just as they still do in modern music. It should be noted, by the way, that rests do not necessarily have to be accommodated within a metric pattern; they may simply provide articulation points for a rhythmic pattern, and this is the way the instrumental interjections function in the *Orestes* fragment, which will be examined directly. Scholars who wish to reject or ignore rests in Greek lyric must be prepared to present a case for their point of view, since the preponderance of evidence supports the presence and function of rests. 57

### The Musical Fragments: Early

The two earliest extant fragments of ancient Greek music come from two works by Euripides: *Orestes (P. Wien G2315)* and *Iphigenia in Aulis (P. Leid.* inv. 510). Detailed discussions of these fragments have appeared elsewhere, especially in connection with problems of reconstruction and transcription, and there is no purpose in recounting all this material. <sup>58</sup> The focus

<sup>57</sup>Pearson, "Dynamics," underscores the point (pp. 54–55): "We cannot give life to Pindar's music unless we can supply more than the patterns which metricians offer us. We may not want to trust our imagination to supply details that are missing, but refusal to use our imagination does not protect us from error. It is hard for me to sympathize with anyone who thinks that, because he cannot see round the corner, there cannot be anything of interest there. . . . I propose, instead, to begin by stating quite dogmatically that in every strophe there must be one or more places where the singer is given time to take a breath without disturbing the rhythm, where he has a rest (the equivalent of a *longum* or a *breve*, sometimes even longer), during which the instruments will not necessarily be silent or the dancers at a standstill; . . ."

<sup>58</sup>The *Orestes* fragment appears in Egert Pöhlmann, *Denkmäler altgriechischer Musik*, Erlanger Beiträge zur Sprach- und Kunstwissenschaft, no. 31 (Nuremberg: Carl, 1970), pp. 78–82; and the *Iphigenia* fragment is reconstructed and transcribed in Mathiesen, "New Fragments," pp. 23–31. Transcriptions of the Greek notation into modern notation have been included in the ensuing figures simply to assist the reader's aural sense of the fragments.

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of this discussion will be limited to rhythmic and metric problems, which have thus far received little attention.

An analysis of the text in the Orestes papyrus, using the principles explained earlier in this study, will reveal that some of the syllables are long, some short, some dichronic, and some common. The papyrus preserves only the middle part of each line, and if the beginnings and endings of each line are supplied from the manuscript tradition, further syllabic characteristics, perfectly in accord with those on the papyrus, emerge. The rhythmic and metric pattern of the text remains ambiguous if it is strictly interpreted by the theoretical principles. But the papyrus also exhibits musical notation, including symbols for notes, rhythmic duration, and instrumental pitches. There are also a considerable number of stigmai, dots placed over the pitch notes and rhythmic symbols. The rhythmic symbols that appear are the diseme (a horizontal line), which lengthens the chronos protos of a single pitch note to two chronoi; the triseme (three vertical lines or a horizontal line with a vertical line attached to the right end), which lengthens the chronos to three chronoi; and the pentaseme (which looks like a supine E), which lengthens the chronos to five chronoi.<sup>59</sup> These rhythmic symbols make it possible to clarify the purely textual rhythm, and by combining the two levels of analysis—textual and musical—it is possible to see how the music defines the rhythm and meter of the composition, just as the theorists have stated it should. Figure 4 provides a transcription of the seven lines of the Orestes papyrus, showing the musical notation, the text (the brackets

For a new study that attempts to provide a fuller analysis of both these fragments and their ethos, see my "Harmonia and Ethos in Ancient Greek Music," *Journal of Musicology* 3(1984):264–79.

indicate the beginnings and the endings of each line supplied by the manuscript tradition), the textual rhythm, and the musical rhythm.

It is immediately clear that the presence or absence of the diseme clarifies the value of dichronic syllables in the text (in every line) or syllables of ambiguous length (in line 3, where the mu-beta juxtaposition admits of varying interpretations)<sup>60</sup> or doubled syllables (in line 6, where the singer could not know without the musical notation whether the two omegas are to be sung as two longs or are to collectively equal one long) or a syllable followed by a double consonant (the alpha-xi in line 4, where the singer might conceivably fail to recognize this as a syllable long by position). The only anomaly is the diseme over the diphthong in line 4, which should surely be recognized as long by nature. But since the notator has placed a diseme over the corresponding syllable in every line, he did so here simply for the sake of consistency and as a precaution.

One of the most striking features of this papyrus is the appearance of the instrumental interjections in lines 5 and 6.61 Without these interjections, the rhythmic pattern of line 5 would be seriously incomplete; the function of the interjection in line 6 is not clear because so little of the text of the first half of the line is preserved. It is not possible to be sure how the second half of line 5 or most of line 6 would actually be sung, but the first half of line 5 would suggest that instrumental notes would complete the rhythmic pattern in these places.

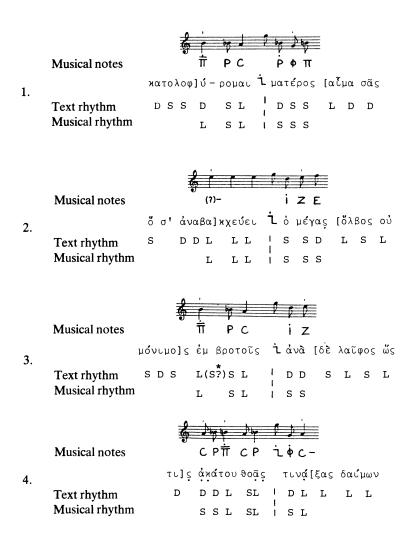
It has always been assumed that the squared zetas in lines 1–4 represent an instrumental note (or an instrumental flourish), and the rhythmic analysis bears this out. These notes provide an articulation point between the basic rhythmic pattern of S-S-S-L-S-L (assuming that most if not all of the dichronic and com-

<sup>&</sup>lt;sup>59</sup>The rhythmic symbols appear in the so-called Bellermann Anonymous I and III. See Dietmar Najock, *Drei anonyme griechische Traktate über die Musik: Eine kommentierte Neuausgabe des Bellermannschen Anonymus*, Göttinger Musikwissenschaftliche Arbeiten, no. 2 (Kassel: Bärenreiter, 1972), pp. 66, 138. The symbols are also discussed in Pöhlmann, *Denkmäler*, p. 141; and Mathiesen, "New Fragments," pp. 27–28.

<sup>60</sup>Cf. Aristides Quintilianus De musica 1.21 and n. 38 supra.

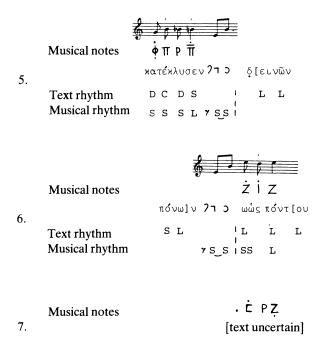
<sup>&</sup>lt;sup>61</sup>The instrumental interjections are indicated by the presence of a diastole, which looks somewhat like a reverse C. On this symbol, see Bellermann Anonymous I (Najock, p. 72).

Figure 4. Rhythmic design of Euripides Orestes in P. Wien G2315



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## Figure 4 continued



<sup>\*</sup>on the special function of the mu in syllabic quantity, see Aristides Quintilianus 1.21.

D = dichronic syllable | = possible position of the thesis

S = short syllable L = long syllable

C = common syllable

mon syllables in the line marked "text rhythm" would be made short by the music, as the surviving notation would suggest) that appears twice in each line. The pattern is, of course, the dochmiac:  $|\bigcirc\bigcirc\bigcirc|$   $|\bigcirc\bigcirc$  .

Finally, the matter of the stigmai demands attention. The initial note of each half of the dochmiac receives a stigme, as can be reasonably inferred from the presence of the second half of each dochmiac on the left side of the papyrus and the first half of each following dochmiac on the right side of the papyrus. The only exceptions are the first note in line 2 of the papyrus, which is not preserved, and the two notes over the repeated vowel in line 6 of the papyrus. Since these two notes collectively sound the first syllable, perhaps it was thought necessary to repeat the stigme. There is also a stigme over each of the instrumental notes in lines 1-4 that divide the dochmiacs. Since the dochmiac is defined (by, among others, Aristides Quintilianus in Book I, section 17) as composed of two parts, an iamb  $( \cup \neg \text{or} \cup \cup \cup )$  and a paeon diaguios  $( \neg \cup \neg )$ , it would appear that the stigme marks off the beginning of each rhythmic part, as well as the articulation point provided by the instrumental interjection.

A number of features have emerged with some consistency in this fragment. These must be kept in mind for comparison with the other Euripidean fragment, the fragment from *Iphigenia in Aulis*.

Analysis of the text in this papyrus reveals the same sort of features encountered in the *Orestes* papyrus. The *Iphigenia* papyrus preserves the left side of each line, and while it might be possible to complete each line from the manuscript tradition—as was done with the *Orestes* papyrus—this will not contribute anything of significance to the topic at hand. In this papyrus, the textual rhythm is once again ambiguous if it is strictly interpreted by the theoretical principles. The musical notation, however, offers some very remarkable indications. Figure 5 provides a transcription of the four notated lines of the papyrus, once again showing the musical notation, the text

(with the brackets indicating where the papyrus breaks off), the textual rhythm, and the musical rhythm.

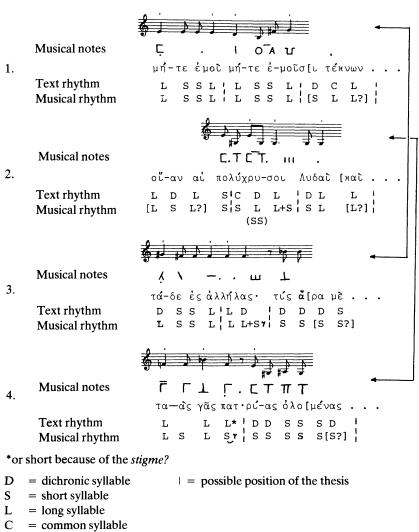
As in the *Orestes* papyrus, the presence or absence of the diseme clarifies dichronic syllables, but it is also used in connection with a triseme (in line 2) and a pentaseme (in line 3) to show how the value of a single note is to be extended over a number of syllables to make them longer than one would otherwise assume them to be. In this way, the musical notation functions just as Dionysius of Halicarnassus observed. The rhythm of this text—with its shifts from choriambs ( $-\cup\cup$ ) to bacchics ( $\cup$  -) at the ends of lines 1 and 2 to trochees ( $-\cup\cup$ ) at the beginnings of lines 2 and 4—is much more complicated than that of the *Orestes* papyrus, and the musical notation helps clarify a rhythm that is otherwise almost irrational.

The *stigmai* are also of interest in this fragment. Here, the *stigmai* mark the end of each initial rhythmic pattern (choriamb in lines 1 and 3, trochee in lines 2 and 4) and then the long syllable of the new pattern that follows. Thus, the *stigme* would seem to mark each rhythmic pattern in a manner similar (though not identical) to that of the *Orestes* papyrus.

To review and summarize these two fragments, a few generalizations can be offered.

- 1. The composer has added a diseme for the most part only where the syllable (metrically speaking) is short, dichronic, or doubled (as in  $\tau\alpha\dot{\alpha}\varsigma$  in line 4 of the *Iphigenia* fragment). The exceptions to this occur in every case over alphas (which are dichronic) followed by a double mute (kappa-chi), a double liquid (lambda-lambda), or a double consonant (xi); and over the diphthong omicron-upsilon. The disemes over the alphas are not too surprising because these syllables are metrically ambiguous (in the figures, these could be notated as D or C rather than L). The diseme over the diphthong is anomalous.
- 2. The composer has not placed a diseme over other notes falling on dichronic or common syllables in order to indicate that these are short.
  - 3. All the other values are unambiguously long or short, un-

Figure 5. Rhythmic design of Euripides Iphigenia Aulidensis in P. Leid. inv. 510



less modified by a triseme or a pentaseme, which make them rather like a dotted note in modern musical notation and set them off on important words or at the ends of phrases (e.g., πολύχουσοι and ἀλλήλας in lines 2–3 of the *Iphigenia* fragment).

- 4. The *stigmai* placed within the musical line mark off major rhythmic units: in *Orestes*, the two parts of the dochmiacs (just as Aristides Quintilanus describes the rhythm as composed of an iamb and a paeon diaguios); and in *Iphigenia*, the initial choriambs (alternating with trochees) and the shift to bacchic or reversed bacchic, a pattern noted by Hephaestion in section 9 of the *Handbook*.
- 5. Rests or instrumental interjections either articulate or complete the rhythmic patterns.
- 6. The rhythmic pattern is made clear only by the music; it remains ambiguous in the text alone,<sup>62</sup> which is subordinate to the melody, as Dionysius of Halicarnassus observes in section 11 of his treatise.

<sup>62</sup>Particularly good examples of the ambiguity appear in the *Iphigenia* fragment in connection with line 2, note 2, line 3, note 6, and line 4, note 4, where common syllables and articulating rests appear; and in the *Orestes* fragment in connection with line 5, note 2, and line 6, notes 3 and 4, where a common syllable and a doubled vowel appear. Until now, the proper rhythmic transcription for these notes has not been clear.

thesis and the brackets indicate—as before—the missing part of the papyrus reconstructed from the manuscript tradition):

The choriambic (if it is construed as a composite of a trochee and an iamb, as might be inferred from Aristides Quintilianus in Book I, section 16) will have a thesis, an arsis, an arsis, and a thesis:  $\frac{1}{1} \cup \frac{1}{1}$ . (The bacchic, which is used with the choriamb, should continue with an arsis and a double thesis.) Thus, the *Iphigenia* pattern might be notated as follows:

Though the two fragments are rhythmically somewhat similar, the arrangement of arses and theses makes them quite distinct.

### The Musical Fragments: Late

For purposes of comparison, it may be informative to apply the analytical techniques to later pieces. These pieces may provide further clarification of certain elements and will in any event provide a stylistic counterpoint to the earlier compositions.

The two pieces selected for analysis in this section are two of the better-known "fragments": the epitaph of Seikilos (generally assigned to the first century A.D.) and the first of the hymns of Mesomedes, the so-called Hymn to the Muse (the notated hymns of Mesomedes are of uncertain date because they are preserved only in the manuscript tradition, which goes back no farther than the thirteenth century). Actually, neither of these pieces is a fragment, and they therefore provide the additional opportunity of analyzing complete pieces.

As was the case in the earlier fragments, analysis of the text in the Seikilos epitaph reveals long, short, dichronic, and common syllables. The rhythmic and metric pattern is inconsistent and ambiguous in the text alone, but this piece is precisely, abundantly, and carefully notated with symbols for notes and rhythm and with *stigmai*. Every symbol is clear and easy to read; thus, there can be no doubt about the interpretation of the notation. The notation provides four lines<sup>63</sup> of perfect iambic rhythm (iambic rhythm can, of course, also accept parallel rhythms that resolve the short-long pattern into groups of

shorts or long-short, as is clear from Aristides Quintilianus in Book I, section 16).

The notator has been quite generous with his rhythmic signs: some syllables that are already long by position or by nature are still given a diseme, and some long syllables that receive two notes (in line 2) are also given a diseme to insure that the singer will know each of these notes receives one chronos. The short syllable near the end of line 3 is given a diseme in order to preserve the rhythmic pattern. A number of trisemes also appear, always on diphthongs or circumflexed long vowels. Thus, these very long and full sounds (metrically speaking) are given extra musical emphasis, especially since they always follow a long musical duration. These syllables with trisemes recall Dionysius of Halicarnassus' observation, noted earlier, that syllables do not have but one nature of long and short: "some are longer than longs and some shorter than shorts."

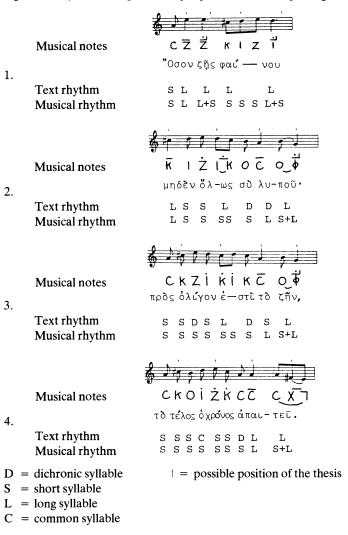
Stigmai are abundant in this composition, and they are used with perfect consistency. Every second iamb is given a stigme, and this marks off the iambic meter quite clearly. Most of the stigmai fall on disemes or trisemes, but two of the iambs are separated into three short chronoi, and in these cases, each of the notes receives a stigme. The same practice appeared in the Orestes papyrus. It should also be noted in connection with the second of these two iambs (in line 4) that the absence of a diseme over the note that falls on the common syllable clarifies for the singer that this note is to be sung as a short rather than a long.

The second of these later compositions, the Hymn to the Muse, exhibits repeated notational symbols for repeated pitches, no *stigmai*, and only a few disemes. These are characteristic features of rather late fragments, <sup>64</sup> and although this hymn is preserved only in manuscripts many centuries later

<sup>&</sup>lt;sup>63</sup>The transcription is drawn from Pöhlmann, *Denkmäler*, p. 54. The epitaph of Seikilos is carved on a round stone column, and the musical part is actually set out on six lines so that it is possible to view it—more or less—from one position. There would not have been enough room on the stone for the music to be carved in four lines, but the music certainly arranges itself in this way when transcribed or performed.

<sup>&</sup>lt;sup>64</sup>Repeated notational symbols can also be seen in the *P. Oxy.* 3161 and 3162. See Mathiesen, "New Fragments," pp. 17–21.

Figure 6. Rhythmic design of the epitaph of Seikilos, Copenhagen inv. no. 14897



than its presumed date of composition (second century A.D.), it may be authentic. Figure 7 provides a transcription.<sup>65</sup>

Here again, short, long, and dichronic syllables appear. There are no common syllables. If the dichronic syllables are taken as short, the textual rhythm is quite clear as it stands: iambic. In this piece, the absence of disemes on dichronic syllables tells the singer that these must be short, and the two disemes in line 3 must be simply precautionary. A few of the long syllables in lines 3 and 4 are divided into two notes, but there is nothing unusual in this. In structural terms, the piece exhibits an attractive rhythmic balance between lines 1 and 3, 2 and 4. Overall, the music contributes little in rhythmic terms to the piece.

While the Orestes and Iphigenia fragments used complex rhythmic patterns that produced interesting contrasts in arsis and thesis, the later pieces both utilize simple iambic patterns with alternating arsis and thesis in a ratio of 2:1.66 The stigmai in the earlier fragments marked out the rhythmic components in lines of some musical complexity; in the later pieces, the stigmai simply mark off a consistent rhythmic pattern or disappear altogether. Despite the greater simplicity of the later pieces, it is still true (and especially in the Seikilos epitaph) that the music clarifies, articulates, shapes, and modifies the poetic text. Neither one without the other is complete. As Aristides Quintilianus posits in Book I, section 19: "Some of the ancients called rhythm masculine and melos feminine, for melos is without actuality and formless, presenting an expression of matter because of the tendency towards the opposite condition, while rhythm molds and regularly moves melos, presenting an expression of active making on the basis of the thing made."67

### Conclusion

The four examples presented in this study are typical of the entire corpus of ancient Greek music; the number of examples could be easily enlarged. It is clear that in the earlier pieces, the rhythmic-metric patterns are of considerable complexity, a complexity that is nonetheless marked out by the metric character of the text, the rhythmic notation, the stigmai, rests, and instrumental interjections. These pieces, of course, are both representative of the work of Euripides, a composer noted for his unusual and dynamic style. Fragments from the work of Aeschylus or Sophocles might well exhibit different characteristics, but that is a question that must remain unanswered—at least for the present. The later pieces are simpler and more direct: the rhythmic notation and stigmai are now more likely to confirm (rather than alter) the metric character of the text—or to be absent altogether. These later pieces seem to have been composed with the rhythmic theory in mind; by contrast, the earlier pieces seem to have provided the subject the rhythmic theory attempts to address. Historians of music theory will not find this surprising. It is a pattern that reappears in the music theory of every style period.

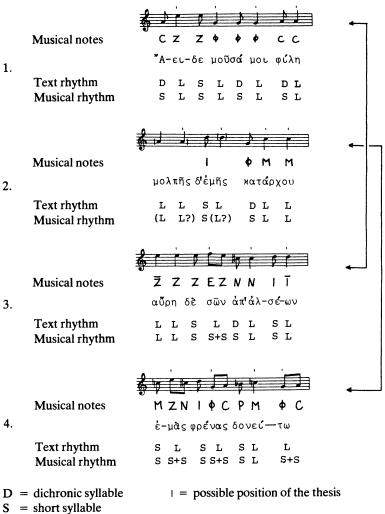
In sum, the key to understanding Greek lyric verse is the discernment of the rhythm in all its complexity and flexibility, not the perception of artificial metric patterns based on fixed quantities. Ancient composers' conceptions—in this respect at least not unlike their modern counterparts—were fundamentally rhythmic. It is probably impossible to reconstruct the rhythmic character of much verse (at least from the Hellenic period) that is preserved today without the music. Nevertheless, the theoretical systems taken together with analysis of the surviving musical fragments can illuminate the Greeks' concept of their verse and assist in the formation of a clearer understanding of its character. This understanding can in turn help scholarship avoid the misapplication of modern metric theory to textual and structural problems where it may serve to distort rather

<sup>65</sup> The transcription is drawn from Pöhlmann, Denkmäler, p. 14.

<sup>&</sup>lt;sup>66</sup>Cf. Aristides Quintilianus *De musica* 1.14. The iambs are described as having a half arsis and a double thesis and are considered as within the duple rhythmic genus.

<sup>&</sup>lt;sup>67</sup>Aristides Quintilianus De musica 1.19 (Mathiesen, Aristides, pp. 102-3).

Figure 7. Rhythmic design of Mesomedes' Hymn to the Muse, Pöhlmann no. 1



L = long syllable

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than clarify. Even in Augustine's day, the conflicting claims of rhythm, meter, and music were recognized in Book II of his treatise *On Music*; his observations are still timely today:

But first I want you to know that the whole of that science called grammatica in Greek, but litteratura in Latin, professes the conservation of historical precedent—either that alone, as reason in its subtler moments teaches, or for the most part, as even stupid minds concede. And so, for example, when you say cano, or put it in verse, in such a way as to prolong its first syllable when you pronounce it or in such a place as to make it necessarily long, the grammarian will censure you; he, of course, the guardian of history, giving no other reason why this syllable should be contracted than that those who lived before us and whose books survive and are discussed by the grammarians used it as a

short syllable, not as a long one. And so, whatever prevails here, prevails as authority. On the contrary, the reason of music, whose province is the rational and numerical measure of sounds, takes care only the syllable in this or that place be contracted or prolonged according to the rationale of its measures. For, if you should put this word where two long syllables ought to be, and should make the first syllable, which is short, long by pronunciation, the science of music will not for that be outraged in the least. For those sound-rhythms have been heard which were necessary to that number. But the grammarian orders its emendation and bids you put in a word whose first syllable must be long according to the authority, he says, of our ancestors of whose writings he is the watchdog. 68

<sup>68</sup>Augustine De musica 2.1 (Taliaferro, 4:206-7).



Some Ancient Conceptions of Rhythm Author(s): C. F. Abdy Williams

Source: The Musical Times, Vol. 64, No. 960, (Feb. 1, 1923), pp. 105-106

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unusually big, so the presence of this stretch—impossible to most players—is no proof that Franck did not solo the whole of this long passage. Incidentally the movement gives us a good—or bad—example of Franck's carelessness in the matter of laying out. No doubt many players have failed to persevere with this splendid and difficult *Finale* owing to the awkwardness of such passages as that quoted above. Yet how much easier Franck could have made it! Thus:



And had the whole movement been in G flat it would have been still easier.

The Pièce Symphonique is rarely heard—its length, difficulty, and loose construction are against it. But it may be improved and tightened up into a reasonably lengthy work by the omission of the middle section of the Andante, of the introduction to the Finale, and of the two passages suggested as cuts in the first movement. As an extreme measure we may even omit the opening Andantino serioso, and start straight away with the pedal solo on page 18. More vandalism! a reader protests. But this is very mild cutting by the side of that applied for years past to Wagner and Shakespeare. When reasonable and careful cutting enables us to keep a fine work in the repertory, there is everything to be said for it. The crime is not in cutting, but in clumsy cutting.

(To be continued,)

# SOME ANCIENT CONCEPTIONS OF RHYTHM

By C. F. ABDY WILLIAMS

The story told by Mr. Ernest Austin in a letter to the *Musical Times* of November, 1922, brings to mind other things connected with the musical 'feet' by the ancients, who loved their 'rhythms' as much as modern harmony writers love their chords. Plato goes so far as to say that the morals of a people are more affected by the rhythms they use than by their melodies.

The words dactyl, spondee, anapæst, and so on, feast. The spondee was accompanied by a hymn now almost exclusively used by poets, were originally whose rhythm consisted of feet of two equal long

musical terms at a time when the poet and composer were one and the same person. They all implied a strictly proportional division of time, a feature that is an absolute necessity to music, but would be ridiculous or repellent if applied to the recitation of modern poetry. Hence, though they have for convenience been adopted by poets, they are not applicable in their true sense to any modern language.

All ancient theorists, without exception, derive the poetic-musical feet, which are our simple bars, from a theoretically indivisible unit of time called the primary time. It is usually translated by our quaver. The combination of two 'times' in one note made the 'long,' equivalent to our crotchet. Four and eight primary times in one note produced the equivalents of our minim and semibreve.

These writers all agree in giving the dactyl the first and most important place in musical feet. It formed the basis of the hexameter. Aristides Quintilianus (A. about A.D. 50) says that the dactyl, and other feet that commence with the thesis, or down beat, produce on the mind an effect of calmness. He and many others tell us that the name is derived from dactylos, a finger, which consists of one long and two short joints. It gave the name dactylic to all duple-measure rhythm.

Time was beaten audibly by foot or hand. From pictures and statues and vases we know that the conductor used little cymbals in his hands and wooden clogs on his feet, to increase the noise of beating the time. In museums are to be seen many examples of these small cymbals; also of the sistrum, a kind of rattle, specially connected with the music of the Temple of Isis. All this noise would not meet with the approval of a modern audience; but the ancients differed from us in many of their ideas of art. It is known, for instance, that the Greeks painted their beautiful marble statues; that their theatre had no curtain, and all scene-changing took place in full view of the audience.

Opposed to the dactyl, but still in the same species, was the anapæst Aristides considers that this is one of the 'exciting' or 'agitated' forms, since it begins with the up-beat, or arsis. It was used for military marches, and in the final chorus of the play the performers marched off the orchestra by way of the parados to an anapæstic song. It was also used for satire and ridicule. From Liddell and Scott's lexicon we learn that the word anapaistos means 'struck back,' 'rebounding.' Hence, a dactyl reversed.

When the Spartans were at war with the Messenians they were told by an oracle to apply to Athens for a leader. The Athenians, not wishing for their success, sent them the most inefficient general they could find in Tyrtæus, a lame schoolmaster. But Tyrtæus turned out to be a poet. His elegies inspired the Spartans to constancy, and, still more, his anapæstic marches, sung with the aulos, so roused the soldiers as they advanced to the attack that they fought with a vigour and spirit that eventually led them to complete victory.

The next foot of the dactylic species is the spondee | d d | and the major spondee | d d |. Aristides tells us that this foot was so named because it was used in the spondee, or libation, a small portion of wine which was solemnly poured out to the gods at a feast. The spondee was accompanied by a hymn whose rhythm consisted of feet of two equal long

notes. The libation was the precursor of the 'grace' sung in monasteries, in college halls, and at City dinners. Aristides continues that from its grave character the spondaic foot was appropriate to hymns to the gods, to religious festivals, and sacrifices. So much was this the case that the official aulos-player, whose presence was necessary at every sacrifice, was sometimes called the *spondaules*.

This use of the spondee was unconsciously resuscitated by Luther and his contemporaries when they invented the chorale; and it has formed the basis of the majority of hymn-tunes in the Reformed churches

since his time to the present day.

As to the calming effect of the spondaic rhythm, many successive authors down to Boethius (born about A.D. 473) tell the story of how Pythagoras was one night examining the stars, when he found a lover trying to set fire to the house of his innamorata, being maddened by jealousy, and by an aulos which was playing in the Phrygian mode. The philosopher ordered the auletes to change to spondaic rhythm; this at once sobered the young man, and brought him to a reasonable temper.

Of the pyrrhic and the double pyrrhic or proceleusmaticus Aristides tells us that, being very rapid, they are impetuous and lively, and proper for warlike dances and contests in the games. Some theorists, who will not allow that a foot can contain less than three primary times, do not recognise the pyrrhic, and call it a vulgar innovation, not a real foot. Bacchius Senior calls it the hegemon, but, unlike Aristides, he does not inform us why he gives it this name. Mr. Austin gave an account of it in his letter above mentioned.

The verb iambizein means to speak evil, to

lampoon. It gave the name iambus to the form

since this was the rhythm at first used

only for scurrilous songs. But the importance of the iambus for serious music was early recognised, and soon gave the name 'iambic species' to all music in triple measure. Aristides says that iambic and trochaic rhythms have great vivacity and fire; but that the triple time in which the two members have respectively the value of four and eight primary times, namely the orthios and semantos are specially dignified on account of the slowness of their movement. Whether these were used for hymns we cannot say. The ancients had no metronome by which they could regulate the tempo. In its place they used the beating of the human pulse. If the primary time was taken to coincide with the beats of the pulse, the pace was 'moderate,' neither fast nor slow. If the primary time was quicker or slower than the pulse the tempo  $(agog\bar{e})$  was 'rapid' or 'slow' respectively. As all pulses differ in their pace, and also differ from time to time in the same individual, the tempo must have varied a good deal. Probably, however, being

The trochee derives its name from trochos, a wheel, a boy's hoop, a running pace. It is something that runs or moves very fast. Aristotle says it is voluble and rapid, and suitable for dancing. Hence it also had the name of choreus, from chorus, a body of dancers. Plutarch

practical people, they left it to the performer to take

the tempo he felt best fitted, and used the pulse only

for theoretical purposes.

informs us that Terpander invented the rapid trochaic dance. Sometimes the trochee was dissolved into the still more rapid tribrach,

Quintuple measure was called pæonic, from the bæon | and the pæon epibatus

rhythm for sacred dances and for hymns. The well-known hymns to Apollo discovered at Delphi in 1893 make large use of pæonic rhythm. Recent research in the domain of English folk-song has shown very decidedly that quintuple rhythm is not the 'unnatural' thing it was considered till comparatively recently, but a very natural and easy rhythm to master when once understood, as explained by Aristides, that its bar should be imagined as divided in the way we have shown in the pæon epibatus.

We have only referred to the most elementary forms of foot. The compound measures described by Aristides are said by him to be more 'pathetic' than the simple measures. There were also 'mixed' rhythms of triple with duple; and it is interesting to see our youngest school of composers unconsciously resuscitating some of the complicated ancient Greek rhythmical forms that our fathers endeavoured to explain away as impossible for the mind to assimilate or tolerate. They are, in fact, doing for the ancient 'mixed rhythms' what Luther did for the spondee when he revived it for religious use in his chorale.

### DR. HULBERT'S LECTURES

A series of four lectures on 'Eurhythm' will be given by Dr. H. H. Hulbert at 160, Wardour Street, London, W., on February 7, 14, 21, and 28, at 8 p.m. Admission is by card of invitation, which can be obtained from Messrs. Novello at the above address. The synopses of the lectures are as follow:

### LECTURE I.

Eurhythm—Its theory, practice, and value in voicetraining.

Its effect upon appreciation, conception, and expression—Its application to accomplishments—Its bearing upon the attitude and poise of the artist—The sense of touch in music and games—The sensation of tone—Conviction and self-control—Artistry and sentiment.

### LECTURE 2.

Eurhythm the basis of musical pronunciation.

The cerebral apparatus of speech—Thought in diction—The movement-feeling word-understanding centre—The sounds of the English language in speech and song—The vowel shapes and the articulatory positions—The neutral vowel and the 'R' sounds—The combined sounds.

### LECTURE 3.

Eurhythm—Its importance in breathing for voice.

The vocal apparatus—Different kinds of breathing—Thoughtful breathing and tonicity—Diaphragmatic and Intercostal breathing—The Abdominal press—The breathing centre for voice—Breathing exercises.

### LECTURE 4.

Eurhythm—Its bearing upon voice and health.

The laws of movement—Value of Music in exercises
—Happiness versus worry—Resisting power of body—
The hygiene of voice—Eurhythmic exercises—Remedial work.



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# ARISTOXENUS ON RHYTHM

# Lewis Rowell

The surviving fragments of musical speculation bearing the name of Aristoxenus of Tarentum (4th c. B. C.) have long been recognized as one of the oldest, most significant, and enigmatic monuments in the theory of music. Although there have been several attempts to reconstruct his complete theory of rhythm by piecing together the extant scraps of text,<sup>1</sup> the task is indeed like reconstructing an amphora from a few shards of pottery. Still the Aristoxenian principles of rhythm, as amplified by later authors and supplemented by the principles of Greek prosody, remained the pedestal on which the rhythmic structure of European art music was based until the Later Middle Ages.

Born between 375 and 360 B. C. in Tarentum, a Calabrian seaport on the arched sole of the Italian "boot," Aristoxenus received a musical education from his father Spintharus, a well known and widely travelled musician, and later studied with Lamprus of Erythrae. His subsequent studies took him to Mantinea, an Arcadian city, and later to Italy again and, after 343, to Corinth. Shortly after Aristotle took up residence in Athens and established his Lyceum, Aristoxenus arrived to join the company of scholars; there he absorbed the Peripatetic philosophy, remained to teach, and became one of the most prominent members of the academic community. Although he had expectations of succeeding

Aristotle, his colleague Theophrastus was designated as the heir, successor, and literary executor. Nothing is known of Aristoxenus' later life, travels, or the date of his death.

Of his thought in general and his influence, a few points may be briefly noted: trained in the methods of systematic thought and scientific observation, his mind sharpened and disciplined by one of Antiquity's most remarkable teachers, Aristoxenus formulated the basic principles of an *empirical* theory of music, a distinct departure from the long-prevailing Pythagorean tradition which he had studied in his youth. Macran's comment is worth quoting:

So busy were the Pythagoreans in establishing the mere physical and mathematical antecedents of sounds in general, that they never saw that the essence of musical sounds lies in their dynamical relation to one another. Thus they missed the true formal notion of music, which is ever present to Aristoxenus, that of a system or organic whole of sounds, each member of which is essentially what it does, and in which a sound cannot become a member because merely there is room for it, but only if there is a function which it can discharge.<sup>2</sup>

This observation is equally applicable to the Aristoxenian theory of musical rhythm: his is a dynamic concept of temporal relationships in which formal function, not determinable magnitude, is the basis for the operation of the system.

Aristoxenus, if we can credit the impressive accomplishments listed in the Suda,<sup>3</sup> was the author of at least 453 books on such diverse subjects as biography, history, philosophy, education, politics, and "table-talk." But of these only two works survive. The longer and better known is the Harmonics, available in English since 1902 in Henry Macran's charmingly Victorian translation.<sup>4</sup> The text, consisting of two complete books and part of a third, appears to be a patchwork and includes interpolations from other authors.<sup>5</sup> Nevertheless, with the aid of later treatises in the Aristoxenian tradition, one can glimpse the full scope of Aristoxenus' harmonic thought and place the surviving text within its proper context of harmonic theory.

The rhythmic fragments are more problematic. The corpus consists of a single continuous passage of some 250 lines, entitled APINTOZENOY PYOMIKON NOTOIXEION B, and a few isolated citations by later authors, notably the 11th-century Byzantine Michael Psellus. Perhaps the best outline of the Aristoxenian theory of rhythm is the concise exposition of Aristides Quintilianus (3rd or 4th century A. D.), in the first of his three books on music. I have chosen to translate the single long fragment (hereinafter B), since it is the only substantial passage on rhythm that can reasonably be attributed to Aristoxenus himself. The translation is based on Westphal's Greek text,

but I have made detailed comparisons with Feussner's text and critical apparatus.<sup>8</sup> Only those variant readings which affect the translation in any substantive way will be noted.

If we are correct in inferring the standard format of a Peripatetic treatise, B is the opening section of the second of three books—very likely the greater part. The missing Book A would be the introduction or  $\pi\rho ooi\mu\omega\nu$ , B the exposition of basic principles, the  $\dot{a}\rho\chi ai$ , and the final book  $\Gamma$  would be organized into a detailed set of  $\sigma\tau oi\chi\epsilon ia$ , "elements." Aristoxenus' method is the systematic dissection of his subject matter, laying out his field of inquiry clearly and proceeding to separate each of his topics from extraneous ideas and potential misunderstandings. He introduces each topic with a precise definition and continues with discussion of the "differences" applicable to each topic, often digressing into brief essays on difficult problems.

The literary style is sententious, argumentative, a bit self-conscious in its rhetoric, and obsessed with logical continuity—constantly referring to the "aforementioned" and promising to make things clear "in what follows." Occasionally the previous references are vague. Aristoxenus, like most Greek authors, is fond of the  $\mu \dot{\epsilon} \nu / \delta \dot{\epsilon}$  construction ("On the one hand . . ./on the other . . ."). His favorite method of argument is by analogy. His writing reveals traces of both the philosopher and the musician: the organization, logic, and style are those of a typical Peripatetic philosopher, but the conclusions are those of a sensitive student of music and the other arts.

The following conspectus of the rhythmic topics treated by Aristoxenus and Aristides Quintilianus will be helpful in determining the context of B. It is clear that what is missing is at least equal in size and import to the present fragment. Perhaps the greatest loss is the set of three topics in Aristides I/19.

Aristid	les (book/chapter)	Aristoxenus (§)
I/13	rhythm defined	1, 2, 7
	its properties: arsis and thesis	
	perception of rhythm	5, 8
	differences of rhythm in motion, speech, and	
	melody	4, 9
	the rhythmicized substance (ρυθμιζόμενον)	3 - 10
	the five topics of rhythm listed:	
	1. the primary time unit $(\chi \rho \dot{\phi} \nu o \varsigma \pi \rho \hat{\omega} \tau o \varsigma)$	
	2. the foot $(\pi o \dot{\nu} \varsigma)$	
	3. rhythmic progression (ἀγωγὴ ῥυθμική)	
	4. rhythmic modulation (μεταβολή ῥυθμική	)
	5. rhythmic composition (δυθμοποιία)	
I/14	primary time	10 - 12

Aristid	les (book/chapter)	Aristoxenus (§)
	composite and incomposite durations types of rhythms: enrhythmic, arrythmic, rhythmoid	13 - 15
	the foot	16 - 21
	the seven differences of the feet:	22
	1. magnitude	23
	2. genus	24
	3. composition	26
	4. proportion (rational/irrational)	25
	5. division	27
	6. structure	28
	7. antithesis	29
	the rhythmic genera	30 <i>ff</i>
	equal (1:1)	
	hemiolic (3:2)	
	duple (2:1)	
	epitritic (4:3)	
		oxenus B breaks off
	combining of rhythmic patterns	
I/15	the dactylic genus (1:1) and its patterns etymologies of terms	
I/16	the iambic (2:1) the paeonic (3:2)	
I/17	compounds of the above	
I/18	a polemic against the indiscriminate combinersts (κενοὶ χρόνοι)	nation of rhythms
I/19	rhythmic progression rhythmic modulation rhythmic composition	
II/15	on the ethos of rhythm	
It w	as an article of faith among Greek theorists th	not the disciplines of

It was an article of faith among Greek theorists that the disciplines of rhythmics and harmonics were parallel and that the same method of exposition and set of structural principles were appropriate for both. The following set of topics, used (with minor variations) by both Aristoxenus and the later Cleonides to organize their *Harmonics*, resembles closely the rhythmic topics:

- 1. note  $(\phi\theta\dot{\phi}\gamma\gamma\phi\varsigma)$
- 2. interval (διάστημα)
- 3. genus  $(\gamma \dot{\epsilon} \nu o \varsigma)$

- 4. system (σύστημα)
- 5. key (τόνος)
- 6. modulation (μεταβολή)
- 7. melodic composition ( $\mu \epsilon \lambda o \pi o u a$ )

Each system—tonal and temporal—was built on the following architectonic progression: unit →pattern →pattern combination →progression →modulation→composition. Whereas the analogy between the single musical tone and the primary time unit is obvious, less so is the analogy between the tetrachord (in harmonics) and the rhythmic foot-the small building blocks and their proportions with which the entire edifice of the system was erected. Certain principles applied to both systems: the concept of genus (proportional relationship of part to part), progression, modulation, composition, and the relationship of form to substance. The differences of the intervals and systems cited by Cleonides<sup>10</sup> are similar to the differences of the feet listed in B § 22. To the Greek mind the various musical dimensions were governed by the same set of laws, differing only in material and in certain idiomatic ways. Their insistence upon this point has inspired the quest for a universal organizing principle that has managed to elude theorists since the time of Aristoxenus.

B—or at least that part of it which remains—is a mixture of straightforward expository detail and broader philosophical analysis. The main issues are these three: the rhythmicized substance (rhythmizomenon), 11 sense perception (aisthesis), and proper rhythmic proportion (as opposed to the free combination of numbers). The latter topic is peculiar to musical speculation, but the first two issues have larger implications and were explored at length by Aristotle himself and by Theophrastus, among others. 12

Aristoxenus' concept of musical time is atomistic, and his temporal forms-expressed as rhythmic proportions-are treated much like geometric forms. If his rhythm can be said to "flow," it does so within strictly defined channels and is articulated by clearly located points. Proper patterns were generated by simple number proportions, and the persistence of the formal functions of these proportions (the genera) was the supreme organizing principle of the Aristoxenian system of rhythm. As for the phenomenon of rhythm itself, it must be felt and marked by physical gesture, impressed upon the aesthetic sense and thereby understood by the mind, and experienced through the action of its ethos. Underlying the entire text is Aristoxenus' recognition that the rhythmizomenon (the "rhythmicized substance"), the raw material to which the principles of rhythm are applied, is a complex, triadic substance in music: it consists of the sounds of the voice, the melodic tones, and the body itself. These remain passive and formless until their activation by the rhythmic forms translates them into articulate speech. melody, and gesture. Whether rational or irrational, composite or incomposite, or differing in any other aspect, the function of musical rhythm depends upon how the operation of rhythmic form upon the rhythmic substance is perceived by the senses. From the tattered remnants of B we can see that Aristoxenus attempts herein not only to inform his readers of the principles of rhythm but also to give them insight into the underlying philosophical foundations of music and the psychological/physiological processes by which music is perceived.

The content of B can indeed be better understood within the larger context of Aristotelian psychological and physical theory.<sup>13</sup> I will explore briefly (1) the relationship of form to substance, (2) the function of the *aisthesis* in perception, and (3) the implications for rhythmic theory of Aristotle's famous doctrine of the "four causes."

Greek, unlike Latin, is abundant in words, often with closely overlapping meanings. Perhaps this explains why drawing fine distinctions between potentially confusing terms is an important part of a typical Aristotelian exposition. One of the great semantic casualties of music theory occurred when the Latin *forma* and *figura* replaced an assortment of Greek words specifying various properties or aspects of what we in English loosely call "form" or "structure." The Greek terms for "form" tended to develop certain specializations of meaning, although not every author maintains these precise lexical distinctions.

ρυθμός (rhythmos): the most significant formal concept underlying the temporal dimension of music. <sup>14</sup> Rhythm is a dynamic species of form, signifying the internal structure of a moving thing—ordered movement, movement in accordance with certain principles of structure. The derivation of ρυθμός has been hotly argued; my conclusion is that the basic meanings "flow" and "pause" have become mingled in its semantic development, representing both (1) the alternation of strong/weak, sound/silence, movement/rest that characterizes the experience of rhythm and (2) the constraints imposed upon the "flow" of music by its internal organization. According to Aristides ρυθμός is a κυήσεως τάξις—an "order of movement." <sup>15</sup>

 $\sigma\chi\eta\mu a$  (schema): a very popular term for outward, visible form—form as opposed to matter. Two semantic tendencies can be discerned: (1)  $\sigma\chi\eta\mu a$  as shape, boundary, contour, outline, or frame and (2)  $\sigma\chi\eta\mu a$  as geometric form: plane figures, networks, linear forms. If  $\dot{\rho}\nu\theta\mu\dot{\phi}\varsigma$  represents emerging form, form as "becoming,"  $\sigma\chi\eta\mu a$  represents existing form, form as "being."

 $\mu o \rho \phi \dot{\eta}$  (morphe): perhaps the least specific of all the formal terms—form as opposed to content, external and/or internal form, form in the abstract, solid forms.  $\mu o \rho \phi \dot{\eta}$  is seldom encountered in rhythmic theory.

τάξις (taxis): the most powerful formal concept and aesthetic criterion in Greek thought, signifying form qua order, disposition, array, arrangement, proportion, ratio. From the time of Plato and Aristotle until the Late Renaissance, beauty of form was held to be a good arrangement of the parts. Other related Greek words were αρμονία (harmonia), συμμετρία (symmetria), and κόσμος (cosmos), all standing for measure, order, and proper mutual relationships (namely "proportional relationships") between parts.

 $\epsilon i\delta o\varsigma$  (eidos): etymologically form that is seen, but developed in the philosophy of Plato into the special concept of "conceptual form"—form as idea, image, "insight," that which is seen with the "eye of the soul," the object of intuition, intuitive perception. The aspect of form known as  $\epsilon i\delta o\varsigma$  is essential form (as opposed to the accidental or superfluous features of objects), the irreducible minimum and/or distinctive feature.

All of the above have, on occasion, been used as synonyms; all were often held to signify "good" form, "proper" form, and all became attenuated in meaning at times to "general appearance," "kind," "character," "manner," and "way." Rhythm, according to Aristoxenus, was both  $\tau \dot{\alpha} \xi \kappa$  and  $\sigma \chi \dot{\eta} \mu a$ : the properly constructed rhythmic foot was a  $\sigma \chi \dot{\eta} \mu a$ , as were the gestures of the body that rendered visible the function of the arsis and thesis.  $\tau \dot{\alpha} \xi \kappa$  was contributed by the proportions of the parts of the foot and the relationship of one foot to another. And the basic definition of harmonics, "the mutual relationships of well ordered sounds," combines the two formal concepts. The notion of  $\epsilon i \delta \sigma \kappa$  was vital to the Greek theory of sense perception, and to that subject we turn.

Entelechy  $(\dot{\epsilon}\nu\tau\epsilon\lambda\dot{\epsilon}\chi\epsilon\omega)$  is a term coined (as far as we know) by Aristotle. It is derived from a phrase meaning "that which has completion" or "that which has a goal"  $(\tau\dot{\epsilon}\lambda\sigma)$ , and it is usually translated as "actuality" (as opposed to "potentiality"). The role of the *aisthesis*, our faculty of sense perception, was to actualize the imprint of form upon the mind. As Aristotle noted in his *On the Soul*, "Matter is potentiality, while form is realization or actuality."

Actuality, to Aristotle, signified both the possession of knowledge (the knowledge of forms and the readiness to recognize them, both stored at the back of one's mind) and the exercise of knowledge (as in perception). Our senses remain inert matter and pure potentiality until they are acted upon by sensible objects. The noun  $aio\theta\eta\sigma ic$  stands for both the process of sensation and the receiving apparatus itself (which Aristotle, in his biological writings, failed to localize). Sense perception is clearly a noetic process, a function of mind responding to external sensation. Matter in all of its manifestations—the organs of sight, hearing, and the other senses as well as the critical mind—was

seen as passive substance, inactive until it receives the impression of the active formal principle. A favorite image used by Aristotle and others was the application of a signet ring to hot wax: the wax remains inert until it takes on the form (but not the material) of the ring. It is interesting to note that Aristides called melody the passive, feminine aspect of music, rhythm the active, masculine principle that imposes form upon the melodic tones.<sup>18</sup> This agent/patient principle was the cornerstone of the Peripatetic theory of perception.

To be ready to perceive properly, the aisthesis must be in a neutral state, not a state of rest but a delicate balance between opposing tensions which could be harmed or even destroyed by overstimulation, just as a tensed string (another favorite metaphor) could be snapped by overexcitement. But the receptive aisthesis is also "primed" by (1) man's natural affinity to certain ratios and proportions, making the mind potentially the same as the objects of the senses, and (2) a knowledge of forms. The actual process of perception is an "assimilation" ( $\partial \mu o i \omega \sigma i \varphi$ ) in which the receiving sense undergoes a change of state and becomes like that which stimulates it.

It would be digressing too far to analyze Aristotle's more controversial doctrine of the "common sense," the coordinator of stimuli that is located "near the heart," which perceives directly what he termed the "common sensibles"—shape, size, number, movement, and time—qualities that cannot be perceived by a single sense. 19 Considering the importance which movement, number, and time have for the perception of rhythm, it would be instructive to know how Aristotle or Aristoxenus would have explained the process. Unfortunately for us, the surviving texts do not address this intriguing question.

In the *Metaphysics* Aristotle set forth his celebrated theory of the "four causes"—the material, formal, efficient, and final causes.<sup>20</sup> Aristoxenus, in the present text, tells us little about the efficient cause (the singer, poet, or composer), nor does he speculate about the final cause of music (although we may safely infer that he shared the prevailing Greek view that education and therapy were as much the proper goal of musical practice as was pleasure). But in the relationship of the remaining two causes—the material cause (the *rhythmizomenon*) and the formal cause (the principles of rhythm)—we have the central issue of B.

# THE ELEMENTS OF RHYTHM B<sup>21</sup>

1. In the preceding book we asserted that there are many natures  $[\phi \dot{\nu} \sigma e \iota \varsigma]$  of rhythm, and we outlined what these were, for what reasons each of these received its name, and what were the underlying principles. Now it remains for us to speak of how rhythm is arranged in music.

- 2. We must once again take up the subject of time units and our perception of them, as set forth in the preceding book, for this is the proper point of departure for the understanding of rhythm.
- 3. One must first understand that there are two certain natures: that of rhythm and the rhythmicized substance, closely related to one another just as the form  $[\sigma\chi\eta\mu\alpha]$  and that which is formed  $[\sigma\chi\eta\mu\alpha\tau\iota\zeta\dot{\phi}\mu\epsilon\nu\sigma\nu]$  are related.<sup>22</sup>
- 4. For just as the body takes on many sorts of shapes whenever its parts are placed in different ways (either some or all of them), in like manner each of the rhythmicized substances takes on many forms, not in accordance with its own nature but in accordance with the nature of rhythm. For speech, which is likewise arranged into time units differing one from another, takes on certain divisions which correspond to the divisions produced by the natural order of rhythm. And the same principle obtains with respect to melos<sup>23</sup> and anything else that is organized rhythmically by means of this rhythm that is composed of time units.
- 5. To continue with the previous analogy, we must now consider the subject of sense perception in our attempt to discern—in the case of each of the previous topics—what is the essential nature of rhythm and of the rhythmicized substance. For to have form imposed on the body is by no means the same thing as any of the forms themselves; on the contrary, the form is a certain disposition of the parts of the body, from whence each individual form somehow arises and is recognized as such. Similarly it must be conceded that the rhythm is by no means the same as the rhythmicized substance, nor is this substance identical to the arrangements of time units made in one way or another.
- 6. But the above resemble one another and do not occur independently. For it is clear that form cannot be produced unless it is initiated by that which is to receive the form. And similarly, rhythm cannot occur apart from the rhythmicized substance that divides the time, since one time unit cannot divide itself (as we remarked earlier) but requires something different to divide it. Thus the rhythmicized substance must be divisible into intelligible parts, with which one could divide the time.
- 7. It is consistent with the preceding to say also on this same phenomenon that rhythm arises whenever the division of the times takes on a certain well-defined order, for not every arrangement of time units is enrhythmic.<sup>24</sup>
- 8. And so it seems plausible and goes almost without saying that not every arrangement of times is enrhythmic; but we must pursue the subject further and attempt to understand by means of the previous analogy until we are convinced by the phenomenon itself. We are well aware of the principles by which we combine letters and musical intervals: that neither in speech do we put together the letters in

random combinations, nor do we so combine the intervals in melody. On the contrary, there are but a certain few ways in which these are properly combined—there are many, however, in which neither can the uttered sound be combined nor can the result be accepted by the sense—nay, it rejects it! For this reason the harmonious appears in many fewer forms, but the inharmonious in many more. And thus it is with regard to temporality: for many of the divisions are commensurable and yet appear foreign in arrangement to the sense; a certain few, however, are both familiar and are capable of arrangement into the natural order of rhythm. The rhythmicized substance, though, is somehow common to both the arrhythmic and the rhythmic: for this substance is by nature amenable to both systems—the enrhythmic and the arrhythmic. To speak precisely, one must understand that the rhythmicized substance is capable of transformation into all kinds of time durations and in all combinations.

- 9. Time, therefore, is divided by the parts of each of the rhythmic substances. Now these substances are three: speech, *melos*, and bodily movement. Thus speech will divide the time with its parts, such as the letters, syllables, words, and the like. Similarly the melodic substance divides the time with its notes, intervals, and systems; and movement by its units,<sup>26</sup> forms, and anything else of this sort that is a component of movement.
- 10. Let us call chronos protos [the primary time unit] that which can be divided by none of the rhythmic substances. Let us call the diseme  $[\delta i\sigma\eta\mu\sigma]$  that which measures twice the duration of the former, the triseme thrice, and the tetraseme four times its duration. The names of the remaining time durations are assigned according to the same principle.<sup>27</sup>
- 11. It is necessary that we attempt to examine closely the function of chronos protos: for of those times clearly manifested to the sense, its role is not to measure the swiftness of the movements in their infinite series; instead its role is to serve as a locus for the placement of the various time units in which are disposed the parts of that which is in motion  $[\kappa uvo\dot{\nu}\mu\epsilon vov]$ . By this I mean just as the voice is moved both in speech and in singing, so is the body in marching, dancing, and other such types of motion. Of the motions thus manifested, it is evident that there must be certain minimal time units in which each of the melodic notes can be placed. And the same principle applies clearly both to speech syllables and units of movement.<sup>28</sup>
- 12. So then we call that time unit primary in which neither can two notes be placed in any manner, nor two syllables, nor two units of movement. How the sense responds to this phenomenon will become evident in our subsequent discussion of the types of rhythmic feet.
- 13. We say that a certain time is incomposite, with reference to its usage in rhythmic composition. It is not at all easy to make clear that

rhythmic composition and rhythm are not one and the same, but the following analogy should be convincing: for just as we have seen, in the nature of *melos*, that it is not the same as the system or melodic composition [*melopoeia*], or the key, or genus, or modulation;<sup>29</sup> so must we presume it to be true with regard to the rhythms and rhythmic composition. Inasmuch as we have discovered melodic composition to be a certain characteristic usage of the melodic substance, similarly we shall say in this rhythmic treatise that rhythmic composition is a certain characteristic usage of the rhythmic substance. We shall see this more clearly in the course of the treatise.<sup>30</sup>

- 14. We call a time incomposite, with reference to the employment of the rhythmic composition, as follows: whenever a certain time duration is perceived as a single syllable, a single melodic note, or a single unit of movement, we call this time incomposite. If, however, this same duration be perceived as consisting of multiple notes, syllables, or movement units, the time will be called composite. We may cite a specific example from our treatise on *Harmonics*<sup>31</sup>: for there the same magnitude may be composite in the enharmonic genus yet incomposite in the chromatic, and further it may be incomposite in the diatonic yet composite in the chromatic; and sometimes the same genus presents the same magnitude as both composite and incomposite-but not, however, in the same place within the system.<sup>32</sup> Now we may see the application of our example: for, on the one hand, a time duration may be either incomposite or composite with reference to the rhythmic composition, and-on the other-a melodic interval may be either incomposite or composite with reference to the genera or the order of the scale. Now then, concerning the general characteristics of incomposite and composite time, let it be stated in this manner:
- 15. Since the criterion is the manner of division, simply let that be called incomposite which is divisible by none of the rhythmic substances, composite that which is divisible by all of them.<sup>33</sup> Now then let us say simply that a duration is incomposite when it is occupied neither by multiple syllables, notes, or units of movement; let it be called composite when occupied by multiples of all or more than one of these; and let it be called mixed when it happens that a duration be occupied by a single note but by multiple syllables, or—conversely—by a single syllable but by multiple notes.
- 16. The foot, single or multiple, is the means by which we mark the rhythm and make it intelligible to the sense.<sup>34</sup>
- 17. Some of the feet are composed of two times—both the upward [arsis] and the downward [thesis]; others of three, either two in arsis and one in thesis or one in arsis and the other two in thesis; still others of four, two in arsis and two in thesis.<sup>35</sup>
- 18. Now it is evident that a foot could not be formed with a single time unit, inasmuch as a single unit cannot constitute a division of time;

for unless there be a division of time, a foot cannot occur. And our apprehension of a foot with more than two units is influenced by its size: for some of the lesser feet, having a magnitude easily comprehended by the sense, are easily and immediately grasped by means of their two units; the greater feet are affected in the opposite manner: for, having a magnitude difficult to be grasped by the sense, they require a greater number of units, so that the magnitude of the whole foot (being divided into many parts) is more easily perceived. It will later be shown why a foot, acting in accordance with its natural function, does not occur with more than four units.

- 19. But one should not assume wrongly from what has been said that a foot is not divided into more than four numbers  $[a\rho\theta\mu\phi\varsigma]$ . For some of the feet are divided into double this number and into many times more. But not of its own nature is the foot divided into quantities greater than four; on the contrary, such a division is the result of the rhythmic composition. One must distinguish carefully between the units that preserve the function of the foot and the divisions arising from the rhythmic composition. And we must add that the units of each foot (being equal) are persistent, both with regard to number and magnitude; but the divisions resulting from rhythmic composition display considerable variety. This will become clear in what follows. <sup>36</sup>
- 20. Each of the feet has been arranged either in accordance with a certain proportion or some irrationality which will lie between two proportions that are intelligible to the sense. The preceding may be clarified as follows: if two feet be taken, one equal in the ratio of arsis to thesis and each of these a diseme, the other a diseme in thesis but half that in arsis; to these let a third foot be taken, having—moreover—the same thesis as the first two but an arsis intermediate in duration to the arses of the preceding. Such a foot will be irrational in the proportion of arsis to thesis, and the irrationality will be between two proportions that are intelligible to the sense: the equal and the duple. And this is known as an irrational choreic. 37
- 21. But let us not misunderstand here out of ignorance of how the rational and the irrational are taken in the principles of rhythm. For just as it is in the elemental principles that apply to intervals, one type is held to be rational in accordance with the melos<sup>38</sup> (which is first sung and subsequently is intelligible with respect to magnitude—like the symphonic intervals or the keys or things commensurate to these), and another type is held to be rational solely with respect to the proportions of the numbers (which happens to be unmelodic); and one must suppose that there are both rational and irrational types among the rhythms. For the one is held rational in accord with the nature of rhythm, and the other rational only with respect to the proportions of the numbers.<sup>39</sup>

Now it is necessary in rhythm that the time duration that is

considered rational must first be among those belonging to rhythmic composition, and consequently that part of the foot in which it is deployed is considered rational. And it is necessary to perceive the other one considered rational according to the proportions of the numbers as similar to the twelvefold nature of the key (with regard to the intervals) and anything else detected in the differences of the intervals.<sup>40</sup>

And from the preceding it is evident that the median being taken between the arses will not be proportionate to the thesis; for they have no measure in common with the enrhythmic.

- 22. Let these seven differences of the feet be set forth: first, according to whether they differ in magnitude from one another; second, according to genus; third, in that some of the feet are rational, others irrational; fourth, in that some are incomposite, others composite; fifth, in that they differ in division one from another; sixth, in that they differ in structure from one another; seventh, according to antithesis.
- 23. A foot differs from another in magnitude whenever the durations occupied by the feet are unequal.
- 24. Feet differ in genus whenever the proportions of the feet differ from one another, such as when one is in equal proportion and another in duple or any other of the enrhythmic times.
- 25. The irrational differ from the rational in that their arsis is not in rational proportion to their thesis.
- 26. The incomposite differ from the composite in that the former are not divisible into smaller feet as are the latter.
- 27. Feet differ from one another in division whenever the same duration is divided into unequal parts, either by both number and magnitude or by one of the two.
- 28. Feet differ from one another in structure whenever the same parts of feet having the same magnitudes are not arranged in the same manner.<sup>41</sup>
- 29. Feet differ from one another in antithesis, some having the time of arsis in opposition to that of the thesis. This same difference will also exist in those feet equal in duration yet unequal in the placement of the arsis against the thesis.<sup>42</sup>
- 30. There are three genera among the feet that take on the successive divisions of the rhythmic composition: the dactylic, the iambic, and the paeonic. The dactylic is that which is in equal proportion, the iambic that which is in duple, and the paeonic that which is in hemiolic.<sup>43</sup>
- 31. The smallest of the feet are those a triseme in magnitude, for the magnitude of the diseme would give an absolutely constricted expression to the foot. Those a triseme in magnitude belong to the iambic genus, for the only proportion contained in the number three will be the duple.<sup>44</sup>

- 32. Second are those a tetraseme in magnitude; these are dactylic in genus: for two proportions are contained in the number four—the equal and the triple; of these the triple is not enrhythmic, but the equal belongs to the dactylic genus.
- 33. Third are those a pentaseme in magnitude, for in the number five two proportions are included—the quadruple and the hemiolic; of these the quadruple is not enrhythmic, and the hemiolic will produce the paeonic genus.<sup>45</sup>
- 34. Fourth are those a hexaseme in magnitude; this magnitude is common to two genera—the iambic and the dactylic: for of the three proportions included in the number six (the equal, the duple, and the quintuple), the last mentioned is not enrhythmic; but of the rest, the equal proportion belongs to the dactylic genus, the duple to the iambic.
- 35. The magnitude of the heptaseme contains no division relevant to the foot; for, of the three proportions comprehended in the number seven, not one is enrhythmic: one is the epitritic [4:3], the second that of 5:2, and the third is the sextuple.
- 36. Fifth, therefore, are those an octaseme in magnitude; these will be dactylic in genus, inasmuch as . . .

#### NOTES

- 1. The most recent of these is Rudolf Westphal's Aristoxenos von Tarent, Melik und Rhythmik des classischen Hellenentums (Leipzig: A. Abel, 1883, 1893; reprint Hildesheim: G. Olms, 1965), 2 vols.
- 2. The Harmonics of Aristoxenus, trans. and ed. Henry S. Macran (Oxford: Clarendon Press, 1902; reprint Hildesheim: G. Olms, 1974), pp. 88-89.
- 3. Suda or Suidas is the name of the lexicon, not an author; this most important historical/literary encyclopedia was compiled near the end of the tenth century.
- 4. Op. cit.
- 5. J. F. Mountford, "Aristoxenus," *The Oxford Classical Dictionary*, 2nd ed. (Oxford: Clarendon Press, 1970).
- 6. The texts have been assembled by Westphal, Aristoxenus, Vol. II, pp. 75-95.
- 7. Aristides Quintilianus, De musica libri tres, ed. R. P. Winnington-Ingram (Leipzig: B. G. Teubner, 1963). See also Rudolph Schäfke's German translation, Von der Musik (Berlin: M. Hesse, 1937). An English summary can be found in W. H. Stahl, Martianus Capella and the Seven Liberal Arts, Vol. I (New York: Columbia University Press, 1971) pp. 219-227. Readers who happen upon C. F. A. Williams, The Aristoxenian Theory of Musical Rhythm (Cambridge: Cambridge University Press, 1911) should be aware that it is not a textual study but an interpretation that attempts to apply the principles of Greek rhythm to 19th-century music. (Ed. note: An English translation of the complete De Musica of Aristides Quintilianus is being prepared for the Yale Music Theory Translation series by Thomas J. Mathiesen.)

- 8. A detailed history of the text is beyond the scope of this paper. For the various sources of the Aristoxenus rhythmic texts see a most important reference: Thomas J. Mathiesen, A Bibliography of Sources for the Study of Ancient Greek Music (Hackensack, N.J.: Boonin, 1974) items 46 (Morelli), 49 (Feussner), 50 (Bartels), 52 (Marquard), and 54 (Westphal, cited above). Feussner (Aristoxenus, Grundzüge der Rhythmik, ein Bruchstück, in berichtigter Urschrift mit deutscher Übersetzung [Hanau: C. F. Edler, 1840] includes Morelli's critical apparatus as well as his own more extensive collection of variant readings; Westphal's critical apparatus appears on pp. CCIV-CCVI of Vol. II.
- 9. Cf. Cleonides, "Harmonic Introduction," in Source Readings in Music History, selected and annotated by Oliver Strunk (New York: W. W. Norton, 1950) pp. 34-46. For the Greek text see Karl von Jan's Musici scriptores graeci (Leipzig: B. G. Teubner, 1895; reprint Hildesheim: G. Olms, 1962) pp. 167-207.
- 10. Ibid., §5 and §8.
- 11. The terms *rhythmizomenon* and *aisthesis* have been retained for the subsequent discussions of their very specialized meanings but discarded in the translation. See also notes 17 and 22.
- 12. Especially in Aristotle's *De Anima* and *De Sensu*, and Theophrastus' *De Sensibus* (for full citations see note 13).
- 13. The following discussion draws on the following sources: Aristotle, On the Soul, Parva Naturalia, On Breath, trans. W. S. Hett (Cambridge, Mass.: Harvard University Press, 1936, rev. 1957); Aristotle, De Anima, ed. with intro. and commentary by Sir David Ross (Oxford: Clarendon Press, 1961); and G. M. Stratton, Theophrastus and the Greek Physiological Psychology before Aristotle (London: Allen & Unwin, 1917).
- 14. For a comprehensive catalog of the uses of the word δυθμός and an account of its semantic development see Robert Christopher Ross, "Pυθμός: A History of its Connotations," Ph.D. diss., University of California, 1972.
- 15. I, 13.
- 16. II, 1.
- 17. aἴσθησις is derived from the verb alσθάνομαι (to perceive, apprehend by the senses, understand).
- 18. I, 19.
- 19. On the Soul, II, 6.
- 20. Book  $\Delta$ , 2.
- 21. Westphal, Vol. II, pp. 77-85.
- 22. Rhythmizomenon is a present passive participle in form, in the nominative singular, neuter gender, and is regularly derived from the verb ρυθμίζω, (to bring into measure, rhythmicize). Its literal meaning is thus "that which is rhythmed." ρυθμός is to ρυθμίζόμενον just as form is to matter, active principle to passive substance. Other similar pairs of terms appear frequently in rhythmic theory, either derived regularly or by analogy: σχημα/σχηματιζόμενον (form/that which is formed) and κίνησις/κινούμενον (motion/that which is moved).
- 23. Melos (melodic substance) should not be confused with melodia (melody). In § 9 Aristoxenus clearly identifies melos as one of the three rhythmizomena.
- 24. Enrhythmic (in rhythm), eurhythmic (good rhythm), and rhythmic are synonyms; arrhythmic means "out of rhythm, nonrhythmic."
- 25. Hermosmenon, translated here as "the harmonious," is a parallel term from Greek harmonic theory and signifies the substance that is organized according to the principles of harmony.
- 26. σημείον is an important word in Greek rhythmic theory. Its literal meaning

- is "sign, mark, signal." I believe that its musical application derives from its usage in mathematics and geometry as a "point." There are two applications in B: (1)  $[\kappa w \eta \sigma \epsilon \omega \varsigma] \sigma \eta \mu \epsilon \hat{\iota} \sigma \nu$ , lit. a "point of [bodily] movement," which I have consistently translated as a "unit of movement," and (2) the  $\sigma \eta \mu \epsilon \hat{\iota} a$  that represent the units of rhythm, small time durations (referring generally to the minimal unit of primary time,  $\chi \rho \dot{\sigma} \nu \sigma \varsigma \sigma \rho \hat{\omega} \tau \sigma \varsigma$ ) or—as in §18-19—the components of the foot: arsis and thesis.
- 27. It seems simpler not to translate the names of the multiples of the basic unit. Seme is an obvious derivation from  $\sigma\eta\mu\epsilon\hat{l}\sigma\nu$ . These are the durations mentioned in B: the diseme (2), triseme (3), tetraseme (4), pentaseme (5), hexaseme (6), heptaseme (7), and octaseme (8). See § 31-36.
- 28. There are several textual questions in this passage, and its sense is not immediately apparent. I take it to mean the following: we recognize chronos protos not because it is the shortest musical duration that can be perceived but because of its appropriateness to the individual units of speech, music, and movement—the syllables, notes, and units of movement. It is a relative, not an absolute, standard of measurement. In line 29 of Westphal's text, I follow Feussner's σῶμα ἐμβαῖνόν in preference to Westphal's ⟨σῶμα⟩ σῆμα σημαῖνόν.
- 29. μεταβολή, following Westphal's emendation (although most of the older sources read μελοποιία).
- 30. Rhythmopoeia (rhythmic composition), according to Aristides (I, 19), was divided into the same three categories as melopoeia: lepsis (choice), chresis (usage), and mixis (mixture). Lepsis refers specifically to the selection of characteristic rhythms, chresis to the appropriate arrangement of the arses and theses, and mixis to the artful combining of rhythms. Rhythmopoeia and melopoeia share also the same three styles (tropoi): the systaltic (contracting), diastaltic (expanding), and hesychastic (soothing). The employment of these tropoi imparted the characteristic ethos to rhythmic and melodic composition.
- 31. III, 60, line 10, through III, 61, line 3. Cf. Cleonides § 5.
- 32. The text of this passage is badly mangled. Westphal (in § 14, lines 26 and 27) omits the phrase καὶ πάλιν τὸ μὲν διάτονον ἀσύνθετον, τὸ δὲ χρῶμα σύνθετον. It has all the earmarks of a gloss, but I have restored it, since it adds the example that clinches the meaning.
- 33. Here I have omitted the sentence πὴ δὲ σύνθετος καί πη ἀσύνθετος ὁ ὑπὸ μέν τινος διηρημένος, ὑπὸ δὲ τινος ἀδιαίρετος ὢν ("How composite and how incomposite [being] that the one is divisible by a certain thing, the other indivisible by a certain thing"). I strongly suspect that it is another gloss, this time adding little to the meaning of the text.
- 34. πούς (foot) has about the same range of meanings as the English "foot"—a human or animal foot, a base for anything, a unit of length, a foot in prosody.
- 36. The opposition between ρνθμός (rhythm) and  $d\rho \omega \mu \delta \varsigma$  (number) plays upon the phonetic and accentual resemblances between the two words, despite the difference of the radical vowel: to be  $d\rho \omega \omega \omega \varsigma$  is to be  $d\rho \omega \omega \omega \varsigma$ ! This passage emphasizes that the divisions of proper rhythm were relative, few in number, and in functional relationship to the structure of the whole; the divisions of the numbers were absolute and included many more possibilities (cf. §8). Apparently rhythmopoeia is closer to the modern concept of rhythm, rhythmos closer to what we call meter.
- 37. Aristides lists two irrational choreics among the feet resulting from mixed genera (I, 17): the iamboid (a long in arsis and two in thesis) and the

- trochoid (two in arsis and a long in thesis). Aristoxenus is citing the first of these in which the arsis is more than one but less than two of the units in the thesis.
- 38. For  $\mu \dot{\epsilon} \lambda o \varsigma$  Feussner has  $\mu \dot{\epsilon} \rho o \varsigma$  (part), but the evidence of the sense of the passage as well as the evidence of most of the texts are on Westphal's side.
- 39. I take this passage to mean that any component of music—while it can in one sense be considered rational in that it can be measured by some absolute number—becomes rational in a special, musical sense only by becoming an actual part of melody or rhythm and can thus be identified as a functioning component within the system. A rhythmic figure of seven beats can be arbitrarily broken down into three proportions (4:3, 5:2, 6:1), as Aristoxenus points out in § 35, but none of the three proportions has a specific function among the accepted genera of rhythm. Hence it is rational only with respect to the combination of the numbers.
- 40. Aristoxenus (Harmonics I, 16, 19-31) and Cleonides (§5) agree on the five differences applying to intervals: in magnitude, in genus, in the symphonic as opposed to the diaphonic (consonant/dissonant), in composition (incomposite/composite), and in proportion (rational/irrational). The differences of the feet set forth in B §22 are obviously patterned after these.
- 41. E.g., the difference between the *simple spondee* (long in thesis, long in arsis) and the *greater anapest* (long in thesis, two shorts in arsis).
- 42. By the first of these principles, the greater anapest (long in thesis, two shorts in arsis) differs from the lesser anapest (two shorts in arsis, long in thesis). By the second principle, the composite foot known as the trochaic bacchic (long-short in arsis, short-long in thesis), a coupled foot of the iambic [2:1] genus, would differ from the greater ionic (two longs in arsis, two shorts in thesis) and the lesser ionic (two shorts in arsis, two longs in thesis), both coupled feet of the dactylic [1:1] genus; all are a hexaseme in magnitude, to use Aristoxenus' terms.
- 43. Dactylic here refers to the proportion 1:1, not to that metric foot which is the reverse of the anapest. The scheme is as follows:

Genus	Proportion	Name of the Proportion	
dactylic	1:1	equal	
iambic	2:1	duple	
paeonic	3:2	hemiolic	

Aristoxenus did not consider the *epitritic* (4:3) proportion enrhythmic, but apparently certain other authorities did.

- 44. In other words, 3 = 2:1. The scheme continues: 4 = 2:2 and 3:1; 5 = 4:1 and 3:2; 6 = 3:3, 4:2, and 5:1; 7 = 4:3, 5:2, and 6:1; 8 = 4:4, 5:3, 6:2, and 7:1, etc.
- 45. Feussner must have been asleep here, substituting—on no apparent textual authority—τριπλασίου (triple) for τετραπλασίου (quadruple) in both instances.

I would like to acknowledge with gratitude the kind assistance of Professor Robert Littman of the University of Hawaii's Classics Department; his comments were of particular value in clarifying some of the peculiarities of Aristoxenus' syntax.



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# PRELIMINARIES TO AN EXPLICIT THEORY OF GREEK METRE

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### 1. INTRODUCTION

Διαφέρει δὲ μέτρον ρυθμοῦ. ὕλη μὲν γὰρ τοῖς μέτροις ἡ συλλαβὴ καὶ χωρὶς συλλαβῆς οὐκ ἄν γένοιτο μέτρον, ὁ δὲ ρυθμὸς γίνεται μὲν καὶ ἐν συλλαβαῖς, γίνεται δὲ καὶ χωρὶς συλλαβῆς· καὶ γὰρ ἐν κρότῳ· ὅταν μὲν γὰρ τοὺς χαλκέας ἴδωμεν τὰς σφύρας καταφέροντας, ἄμα τινὰ καὶ ρυθμὸν ἀκούομεν. καὶ ἵππων δὲ πορεία ρυθμὸς ἐνομίσθη καὶ κίνησις δακτύλων καὶ μελῶν σχήματα καὶ χορδῶν κινήματα καὶ τῶν ὀρνίθων τὰ πτερυγίσματα. μέτρον δὲ οὐκ ἄν γένοιτο χωρὶς λέξεως ποιᾶς καὶ ποσῆς. Ἔτι τοίνυν διαφέρει ρυθμοῦ τὸ μέτρον, ἢ τὸ μὲν μέτρον πεπηγότας ἔχει τοὺς χρόνους, μακρόν τε καὶ βραχὺν καὶ τὸν μεταξὺ τούτων τὸν κοινὸν καλούμενον, ὅς καὶ αὐτὸς πάντως μακρός ἐστιν ἢ βραχύς· ὁ δὲ ρυθμὸς ὡς βούλεται ἔλκει τοὺς χρόνους. πολλάκις γοῦν καὶ τὸν βραχὺν χρόνον ποιεῖ μακρόν.

(Longinus, Proleg. in Heph. 83.1-16 Consbruch)

In the above passage Longinus clearly formulates the distinction between rhythm and metre and indicates the nature of the linguistic units that are relevant to metrical structure; he makes a binary classification of syllables and notes the (correct) interpretation of syllaba communis as not a separate category but arising from variation of certain phonological sequences between the categories of light and heavy syllable. The traditional teaching of Greek (stichic) metre in schools and universities and the accounts in many handbooks reflect such an analysis of metre in terms of two metrically distinctive syllable weights and two corresponding metrical elements. For some years now, however, there has been an increasing tendency, particularly in the work of West<sup>1</sup>

<sup>1</sup> M. L. West, "A new approach to Greek prosody," Glotta 48 (1970) 185 ff.

and A. M. Dale,<sup>2</sup> but also in that of Irigoin,<sup>3</sup> Wifstrand,<sup>4</sup> and incipiently in that of Maas,<sup>5</sup> to go beyond this traditional binary classification into heavy and light syllable and *longum* and *breve* elements, replacing them with a multiplicity of supposedly metrically distinctive classes of syllable types to which are ascribed differences of phonetic duration and a multiplicity of metrical elements correlating with subsets of those classes. The resulting metrical schemes are, in complexity, reminiscent of the rhythmical constructs of Boeckh and Westphal. Although of course the latter were arrived at on the basis of quite other criteria, one may suspect that the ultimate goals and motivations of the two schools are not so disparate, and we shall argue in this paper that in one critical supposition the two schools are closer to each other than either is to traditional metrics. We refer to this modern school as the metrical-rhythmical (MR) school.

### 2. DISTINCTION BETWEEN METRE AND PERFORMANCE

In any discussion of metre and rhythm it is essential to distinguish clearly between the structurally relevant properties which determine what are and what are not acceptable lines, on the one hand, and the variable, structurally irrelevant effects of performance on the other. Since even the same line may be performed with different rhythmical characteristics without its metre being changed thereby, it follows that the requirements of the metrical pattern are independent of and more abstract than the concrete, phonetic variations of individual performances. Accordingly our discussion will not be directed towards performance factors. Similarly, at a higher level of generalization, different styles of performance may have different rhythmical patterns, whether these be close reflections of the metrical pattern or more divergent, externally imposed rhythmicizations. The rhythmical patterns of standard performance styles are again not directly relevant

<sup>&</sup>lt;sup>2</sup> A. M. Dale, The Lyric Metres of Greek Drama (Cambridge 1968<sup>2</sup>) and Collected Papers (Cambridge 1969) = Coll. Pap.

<sup>&</sup>lt;sup>3</sup> J. Irigoin, review of L. Rossi, Metrica e critica stilistica (Roma 1963), in GGA 217 (1965) 224 ff.

<sup>&</sup>lt;sup>4</sup> A. Wifstrand, Von Kallimachos zu Nonnos (Lund 1933).

<sup>&</sup>lt;sup>5</sup> P. Maas, Greek Metre, trs. H. Lloyd-Jones (Oxford 1962<sup>2</sup>).

to metrical structure: unmetrical sequences may be rhythmicized, but they do not thereby become metrically acceptable. Accordingly our discussion will not be concerned with rhythmical pattern in this sense. We discuss these distinctions elsewhere and draw attention to the confusions that have arisen from neglecting them.<sup>6</sup> As indispensable as they are, however, they deal only with the initial clarification of procedures in metrical analysis. Our concern in this article is with the principles and determinants of metricality in the fundamental sense of the characteristics that are inherent in all acceptable verses (of a given metrical type) and the rules that generate (or define) all and only acceptable verses.

### 3. ANALYSIS OF THE ORIGINS AND DEVELOPMENT OF MR THEORY

Beginning in the early part of the nineteenth century the major emphasis in metrical theory centered on the elucidation and application of the doctrines of Aristoxenus and the ancient rhythmicians to metrical structures that were, in effect, treated as given (at least from the point of view of metricality as defined above). One of the primary objects of this tradition in metrical scholarship was the reconstruction of the rhythmical values of the standard performances of Greek verse. Boeckh is generally regarded as the primary founder of this rhythmical tradition, and his procedures and assumptions are instructive for an understanding of all later elaborations of this orientation. He was the first modern scholar to make the connection between "long anceps" and the alogia of Aristoxenus and was characteristically concerned with the problem of the durational values that were assigned to the syllables of a spondaic foot in an iambic context in order to preserve the durational ratios characteristic of that rhythm. He proposed that the ratio of  $\bar{S}$  to  $\bar{S}$  in such a spondee would have been 9/7 to 12/7. A basic axiom of his theory was: "necesse est, ut versibus per varia rhythmica genera compositis adhibitum sit remedium qualecunque, quo iis aequalis insereretur temporum divisio."7 The attempt to determine these remedia constituted a central and constant goal of the rhythmical

<sup>&</sup>lt;sup>6</sup> A. Devine and L. Stephens, "Greek metrics: methods and goals," to appear in GRBS.

<sup>7</sup> A. Boeckh, De metris Pindari (Berlin 1811) 105.

tradition from Voss, Apel, and Westphal to Kral and del Grande, however the individual representatives might differ on such issues as the use of modern music, the strength of the Takteinheit, the sharpness of the dichotomy between gesungener and gesagter Vers, and so on. For metres consisting, as it was thought, of "mixed feet," and for Aeolic in particular, the suggested remedia, rhythmicizations,  $\chi \rho \dot{\rho} \nu \theta \mu o$ ποιίας ἴδιοι, plasma, etc., led to elaborate and complicated durational schemes. But it should be understood that, quite unlike the modern MR analyses, all these proposed rhythmical schemes took the metrical structure in the sense of the arrangement of linguistic heavy and light syllables as its starting point: this is clear since the rhythmical tradition never attempted to work out the additional rules for and constraints on rhythmicization or plasma in relation to linguistic units that would be necessary if the metrical structure were to be deducible from a scheme of rhythmical durations. It should be kept in mind that the 19th century rhythmical theories tacitly assumed the relation:

arrangement of linguistic units  $\xrightarrow{\pi\lambda\acute{a}\sigma\mu a}$  durational values/context

whereas, as we shall see, the MR theories dominant in the 20th century explicitly assume the contrary:

durational values -> arrangement of linguistic units

that is, they seek to explain (and therefore predict) the distribution of linguistic units in metre as a consequence of the durational requirements of a quasi-rhythmical pattern.

Just like the modern MR theorists, most scholars of the rhythmical tradition were interested in differences of phonetic duration between syllables depending on segmental structure and word boundary. They were, however, never explicit about the relation between these assumed phonetic durations and the durational values or ratios of their rhythmical schemes; for some this was simply not a relevant question, for others, although perhaps relevant in some regards, clearly a secondary issue. For example Westphal, Rossbach and Gleditsch<sup>8</sup> accepted in a modified form the remarks of Choeroboscus in Hephaestion (180 Consbr.),

<sup>8</sup> R. Westphal and H. Gleditsch, Theorie der musischen Künste der Hellenen, dritter Band, erste Abtheilung: Allgemeine Theorie der griechischen Metrik (Leipzig 1887<sup>3</sup>) 95 ff. [This work is identical in title to that cited in note 17; the text matter is identical to that of the work cited in note 19 which contains different prefatory matter by Westphal.]

Dionysius of Halicarnassus (De Comp. Verb. 576 UR) and Aristides Quintilianus (41 f. W-I) on the fractional durations of consonants and recognized 5 syllable "quantities" in the Greek language; however, in contrast to the MR approach, these five quantities were supposed to have been reorganized for metrical purposes into 2, so that it would seem none was individually relevant to metrical structure or, even, to rhythmical plasma. In as much as Westphal had come to insist strongly on the separation of gesungener from gesagter Vers, claiming that the latter, unlike the former, did not function in terms of the xpóvos  $\pi\rho\hat{\omega}\tau$ os, that it did not have χρόνοι γνώριμοι  $\tau\hat{\eta}$  αἰσθήσει, but χρόνοι άγνωστοι, and consequently was not structured in feste Takte but Versfüsse, it might be thought that the 5 assumed durational categories of the language would have played an important role in the analysis of spoken verse. But this analysis in the Westphal school remained performance oriented and left gesagter Vers a less stable and precise version of gesungener Vers, in the treatment of which there is no hint of the relevance of such sub-categories of linguistic syllables. In Gleditsch's traditional discussions of prosody the ἄγνωστοι χρόνοι were not mentioned, even in regard to the asymmetry between the dactylic arsis and thesis in the matter of hiatus, failure of epic correption, digamma, resonant lengthening, etc.9 The ἀλογία of Dionysius of Halicarnassus was explained diachronically in performance terms in the discussions of the hexameter. It was simply asserted that kyklische Messung was to be assumed for die Hexameter der Bukoliker and no data from the metrical use of language items were offered; similarly Ludwich in his excursus on Nonnus never sought to relate the many word boundary restrictions to constraints on phonetic duration motivated by the verse rhythm. 10 For the Westphal school, even Porson's bridge was treated nondurationally, being explained by quasi-phonetic assumptions about ictus:

### Nebeniktus $\rightarrow$ Hauptiktus $/ \overline{S} \# [\overline{S}]$

 $^{9}$  The asymmetry between arsis and thesis was not accounted for, but the variation between the syllable weights  $\bar{S}$  and  $\check{S}$  of sequences involving these phenomena was given sound, diachronic linguistic explanation, in marked contrast to the untenable theories current in this century.

<sup>10</sup> A. Rossbach and R. Westphal, Theorie der musisichen Künste der Hellenen, dritter Band, zweite Abtheilung: Specielle Griechische Metrik, Griechische Metrik mit besonderer Rücksicht auf die Strophengattungen und die übrigen melischen Metren (Leipzig 1889<sup>3</sup>) 12–78.

so that # had to be excluded after  $\bar{S}$  in the fifth foot of the trimeter because the fifth foot must, as was assumed, receive only the *Nebeniktus* (note 10, 223).

Other rhythmists, however, made different assumptions about the relevance of assumed phonetic differences in syllable durations, although they never received more than cursory or incidental notice. Shorey 11 believed in 7 quantities and apparently considered them somehow metrically relevant; Goodel 12 speculated that the rhythmicization of "mixed feet" might vary depending on the segmental structures of the light and heavy syllables implementing them. For example, the syllables of a trochee in a dactylic context would be assigned different durations as follows:

$$\overline{V}CC(C)V \rightarrow - - / - \cdots$$
 $\overline{V}CVTR \rightarrow - > / - \cdots$ 

Obscure remarks such as Herodian's (2.709 Lehrs)  $\tau \delta \phi \dot{\nu} \sigma \epsilon \iota \mu \alpha \kappa \rho \delta \nu \mu \epsilon \iota \zeta \delta \nu \dot{\epsilon} \sigma \tau \iota \tau \sigma \hat{\upsilon} \theta \dot{\epsilon} \sigma \epsilon \iota \mu \alpha \kappa \rho \sigma \hat{\upsilon}$  were sought out as explanatory principles. The general concern was to establish their programmatic assumption that a binary distinction of syllables was mechanistic and inadequate, whether for describing the rhythms of verse performance or the language itself. It is easy to understand, given the concerns and assumptions of the rhythmical tradition, that no attempt should have been made to elaborate a system of correlations between the two.

With the rise of the "New Metric" at the end of the nineteenth century, the emphasis was shifted to a concern with the historical origins and development of Greek metre and a classificatory analysis of lyric on the basis of constituent subsequences. The more preliminary and fundamental questions of metrical theory, however, remained largely unexamined. In particular, metrists continued to assume, if tacitly, that metricality was basically a matter of time-values. But with the decline of interest in external rhythmics, these time-values assumed a new status: they no longer referred to the durational relations of musical notes but came to be associated with the elements of the metrical pattern itself.

<sup>&</sup>lt;sup>11</sup> P. Shorey, "Choriambic dimeter and the rehabilitation of the antispast," *TAPA* 38 (1907) 63.

<sup>12</sup> T. Goodell, Chapters on Greek Metric (New York 1901) 212.

By this time a considerable body of detailed philological work had developed on the metrical distribution of linguistic phenomena. Scholars from Porson and Hermann to Naeke, Hilberg and Meyer <sup>13</sup> had observed a disconcertingly large number of restrictions on word boundaries. Apparent restrictions on the sorts of intervocalic consonants permitted in resolutions had been collected by Seidler, Müller, Witkowski, <sup>14</sup> et al. Wernicke <sup>15</sup> and Hilberg had also noted restrictions on positional lengthening. For the most part this work was done purely at the observational level and in conjunction with textual criticism, but there grew with it an explanatory framework: these phenomena were to be accounted for in terms of phonetic duration—"ut in efferendo anapaestus facile fluat" (Witkowski, note 6).

The full consequences of this work and orientation, however, were not articulated into a theory of *metre* until the 20th century. The decisive step appears to have been taken by Maas, for he assumed that metrical elements were defined directly in terms of time values rather than merely rhythmicized into those values, in his attempt to define the phenomena of *anceps* and *biceps*. Thus he was drawing upon constructs of the old rhythmical school, but attributing to them a metrical rather than a rhythmical status. Maas's *anceps* with a "time value somewhere between that of *longum* and that of *breve*" and West's 1.4:1 ratio 16 are

13 R. Porson, Euripidis Hecuba, supplementum ad praefationem (Cambridge 1802<sup>2</sup>) xxx-xxxiii; G. Hermann, Orphica (Leipzig 1805) 692; A. Naeke, "Callimachi Hecale IV, V," RhM 3 (1835) 517; J. Hilberg, Das Prinzip der Silbenwaegung und die daraus entspringenden Gesetze der Endsilben in der griechischen Poesie (Vienna 1879); W. Meyer, "Zur Geschichte des griechischen und lateinischen Hexameters," Sitzb. Bay. Akad. (1884) 979–1089.

<sup>14</sup> A. Seidler, De versibus dochmiacis tragicorum graecorum II (Leipzig 1812) 385; C. F. Müller, De pedibus solutis (Berlin 1866); W. Kopp, "Ueber positio debilis und correptio attica im iambischen Trimeter der Griechen," RhM 41 (1886) 258 ff.; S. Witkowski, "Observationes metricae in Herodam," Analecta Graeco-Latina philologis Vindobonae congregatis (Krakow 1893) 1 ff.

15 F. Wernicke, Tryphiodorus (Leipzig 1819) 173.

West (note 1, 191) uses the term "mean-time" erroneously: the figures he gives are the mid-points between the extreme values of his parameters. The mean is the expected value and measure of the central tendency of a frequency distribution; for West's scheme it is the expected value of the "duration" of a position. To calculate the mean-time of a Westian position correctly, one would need to know the frequency distribution of his posited syllable types in that position, information which West does not provide or even consider. Thus if syllable type i had duration  $d_i$  and relative frequency  $p_{ij}$  in position j, the mean-time of position j,  $\overline{d}_j$ , is given by

$$\bar{d}_j = \sum_i d_i p_{ij}$$

clear descendants of Boeckh's 12/7:9/7, Westphal's  $2:1.5^{17}$  and of widespread identification of anceps with the å $\lambda o \gamma o s \chi \rho o \nu o s$  and quite in contrast with, e.g., Hermann 18 §§33 and 65–66 which allow free variation of the distinct metrical elements longum and breve. Likewise, the postulation of a distinct metrical element biceps grows out of the rhythmical å $\lambda o \gamma i a$  of the cyclic dactyl.

Now a fundamental distinction was drawn by 19th century scholars between rhythmical analysis and metrical analysis. Hermann warns against the confusion of the former with the latter: "prorsus diversae sunt;" Westphal treats them "getrennt" as "selbständige Discipline," 19 following the ancients, as he remarks. Thus for Westphal in anceps position "Die Thesis kann sich daher 20 . . . im Metrum durch eine lange Silbe ausgedrückt werden, dem Rhythmus nach ist sie jedoch nur ein άλογος χρόνος (tempus irrationabile) von  $1\frac{1}{2}$  Moren" (our italics) (note 10, 180). At first sight, it might appear that in attributing metrical status to the old rhythmical units, the school of metrics founded on Maas was not achieving an advance, but, on the contrary, merely blurring a previously recognized distinction. This is probably a valid criticism, but it misses the essential methodological innovation: evidence was now sought in the metrical distribution of linguistic units for the hypothesized additional metrical elements. The philological foundations of this approach had already been laid, as we have seen, by the distributional studies of the 19th century. It was finally possible for the metrist to escape from the rigid constraints of the "entweder oder" (Shorey, note 11, 59) of the "print-and-paper-limited fashion" longs and shorts (Dale, note 2, Coll. Pap. 191), and for the rhythmist to

West, however, bases his conclusions on the formula

$$(\max d_{ij} - \min d_{ij})/2$$

which can readily be seen not to give a mean value.

<sup>&</sup>lt;sup>17</sup> R. Westphal and H. Gleditsch, Theorie der musischen Künste der Hellenen, dritter Band, erste Abtheilung: Allgemeine Theorie der griechischen Metrik (Leipzig 1887<sup>3</sup>) 132.

<sup>18</sup> G. Hermann, Epitome doctrinae metricae (Leipzig 1844) 13, 21.

<sup>&</sup>lt;sup>19</sup> R. Westphal, Theorie der musischen Künste der Hellenen, erster Band: Griechische Rhythmik (Leipzig 1885<sup>3</sup>) xiii.

<sup>&</sup>lt;sup>20</sup> Because of certain performance characteristics attributed to Westphal's postulated *Hauptiktus*.

"rise in revolt against syllable-counting metrists" (Shorey, note 11, 63) on the basis of philological data rather than of musical speculation.

It was Wifstrand who began to articulate this theory to its full potential. He endeavoured to explain "die Unauflösbarkeit der longa" in the hexameter by assuming that metrically the first element of the dactylic foot (in this metre) was shorter than the second element (the biceps) and thus shorter than two light syllables. Most importantly, he attempted to support this contention by adducing additional linguistic data such as the limitation of positional lengthening before initial digamma to the longum and similar restrictions. This approach, which saw in duration the prime explanation for distributional differences in all conceivable circumstances, reached its culmination or reductio in the theory of West. Although, in fact, it is distinct both from the purely rhythmical tradition of Westphal, and from the purely metrical tradition of Hermann, this general approach operates with the same sort of data as the latter but, as we shall argue, uses those data to establish a pattern that is both formally and substantially a rhythmical and not a metrical pattern. This is why we refer to this approach as the metricalrhythmical (MR) theory.

## 4. GENERAL CHARACTERISTICS AND DIFFERENT VERSIONS OF MR THEORY

The metrical-rhythmical theory of Greek metre is idiosyncratic in a number of ways. Its distinctive elements are greater in number and implemented at a lower level of phonological abstraction than is to be expected on the basis of what we know of other metrical systems of languages throughout the world, where there are never more than two metrical elements and these elements are always implemented by major phonological classes or superclasses. This makes the MR analysis typologically suspect. A related point is that the evidence for the independent existence of the posited multiple classes of durations as distinctive and functional classes in the language, rather than heterogeneous ad hoc classifications or subdivisions, is not as strong as it is for the traditional binary classes of heavy and light syllable, which function as such in important rules of the phonology and the morphology. Nor do the posited metrical elements always appear to have single, firmly

substantiated correlates in the language. We shall see that these idiosyncrasies are symptoms of major shortcomings both in the evaluation of the data on which MR theory is based and in the theoretical assumptions with which it operates.

There are two major categories of MR theory, distinguished by the way in which the pattern elements are defined. They are the "Ideal Values" theory and the "Parameter" theory. Within the Ideal Values theory two subtypes should be distinguished, the "distortion" theory and the "standard ideal values" theory for which distortion is not an essential characteristic of metricality. In the first, less sophisticated version of the Ideal Values theory the claim is made (implicitly) that metre is a set of instructions for and limits to the modification or distortion of language required to satisfy the ideal values of the multiple metrical elements. For instance, in the view of A. M. Dale "a short vowel followed by mute + liquid [represents a linguistic sequence] which in a given context could be adapted to the required length by modifying the pronunciation"<sup>21</sup> (our italics). The second version operates with a less performance-oriented conception of metricality and either assigns fixed ideal durations to its multiple elements or specifies the durational ratios in which those elements ideally stand. The Parameter theory, on the other hand, specifies not a value or ratio as the ideal to be aimed at, but an interval or parameter of durations defined by the minimum and maximum permissible durations: each metrical element is thus described in terms of a parameter.

### 5. MAJOR DIFFERENCES BETWEEN MR THEORY AND TRADITIONAL METRICS

MR theories of all types differ from traditional metrical analysis on two fundamental and distinct points. Firstly MR theories assume more than two structurally relevant metrical elements, and often more than two metrically relevant linguistic categories: we shall examine below the philological and theoretical evidence that has been, or might be, adduced to substantiate the hyperbinary durational categories ascribed to the Greek language and assumed to be metrically relevant in MR theory, and the hyperbinary metrical elements that depend in part

<sup>&</sup>lt;sup>21</sup> A. M. Dale, "Observations on dactylic," Coll. Pap. 185.

on the metrical relevance of those categories. Secondly, and less obviously but equally importantly, MR theories tend to operate with a quite different understanding of the perception of metricality by poet and audience. Let us consider this latter point first.

### 5.1. MODEL OF PERCEPTION OF METRICALITY

Traditional metrics works in terms of feature matching, i.e., the distinctive phonological syllable feature values heavy and light (or ± heavy) are matched with or mapped onto the metrical elements which are likewise defined by some comparable metrical feature values,<sup>22</sup> longum and breve (± longum). For MR theory, on the other hand, the syllables of a particular language sequence are measured individually according to their duration and then assigned to the correct metrical element (ideal value or parameter). Thus syllables are assumed not to be evaluated for metricality on the basis of categorizations preassigned by the language, but to be examined singly and directly in order to ascertain which metrical element or elements they satisfy the durational requirements of. An important consequence of this model of the perception of metricality is that it does not necessarily depend on linguistic categorizations; it could, potentially, be a rhythmical pattern of external nature to which language is being versified, and we shall argue below that this is the implicit conception of the metrical pattern in MR theory. Such a conception of metricality would be consonant with the very physicalist interpretation of the function of duration in metre, which is implicit in the work of some MR theorists. But it is easy to see that physical duration at the level of the utterance cannot be the metrically relevant property, and that this idea would never have been entertained if certain empirically necessary distinctions in levels of phonological abstraction<sup>23</sup> had been properly and consistently drawn.

Let us briefly consider these levels, starting with the most physical level and proceeding towards the more abstract.

(a) Is the criterion of metricality the duration of any given syllable at the level of its actual physical duration in the nonce utterance? No: if

<sup>&</sup>lt;sup>22</sup> This is a fundamental principle of all metrical systems, and we discuss it in detail in "The abstractness of metrical patterns," *Poetics* 16 (1975) 411 ff.

<sup>&</sup>lt;sup>23</sup> Autonomous, not morphophonemic, abstraction.

it were, unmetrical stichoi would be accepted as metrical. This is so because at this level, although the physical durations of phonologically heavy and light syllables typically follow normal or Gaussian curves with different means and variances,<sup>24</sup> the tails of these curves overlap; i.e., some long vowels are in actual utterances shorter than some short vowels and some short vowels longer than some long ones. Although we have no measurements for syllables, we feel that (here and below) the same relationships would most likely apply also outside monosegmental syllables. Therefore, if this were the metrically relevant level of phonological abstraction, the requirements of the elementum longum would be satisfied by at least some instances of the phonologically light syllable (and vice versa those of the breve by the heavy): but they are not.<sup>25</sup> Therefore some abstraction (i.e., ceteris paribus correction or normalization) must be applied.

(b) Is the criterion of metricality the duration of any given syllable when allowance is made for difference of tempo (ratio theory)?<sup>26</sup> No, because the curves of the frequency distribution of actual durations still overlap even with normalized tempo. For instance, in Hungarian, a language with quantitative metre *inter alia*, vowel duration has been

<sup>24</sup> It is interesting to note that the variance of the distribution for long vowels is uniformly greater than that for short vowels:  $\sigma \tilde{v}^2 > \sigma \tilde{v}^2$ . Cf. N. Trubetzkoy, "Quantität als phonologisches Problem," Actes du IVème Congr. Int. des Linguistes (Copenhagen 1938) 117 ff.

 $^{25}$   $\bar{S} \rightarrow \check{S}$  due to sandhi processes, etc., is, of course, not relevant here. A sandhi rule either applies or does not apply; the abstract, pre-sandhi representation is never to be considered a third quantity.

<sup>26</sup> Gordon Peterson (reported by A. Rosenzweig, A Spectrographic Analysis of Consonant Length in Standard Italian, PhD diss. University of Michigan, 1965) has developed a procedure for normalizing segment durations, so that tokens from different utterances can be compared as if they were all spoken at constant tempo. For syllables the procedure would be as follows: (1) define the tempo of an utterance (respectively verse performance) as the average duration of a syllable in that utterance; thus if  $d_i$  is the duration of utterance i and there are  $n_i$  syllables in that utterance, the tempo  $t_i$  is  $t_i = d_i/n_i$ . (2) Determine the average tempo,  $\bar{t}$ , of all utterances in question,

$$\bar{t} = 1/N \sum_{i=1}^{N} t_i$$

(3) the normalized duration of a syllable token in any given utterance i then is its actually measured duration multiplied by the normalizing factor  $\bar{t}/t_i$ , i.e., the normalized duration  $\beta_{ij}$  of syllable j with actual duration  $s_{ij}$  in utterance i is

$$\mathfrak{g}_{ij} = (s_{ij} \times \bar{t})/t_i$$

shown to be critically dependent on length of the word.<sup>27</sup> (In one instance an initial long vowel is shorter than a final short vowel by almost 30% of its own duration; and in final syllables of words of different length, we find that a short vowel in the final syllable of a dissyllabic word is longer than a long vowel in the final syllable of a tetrasyllabic word.) Therefore, at this level of phonological abstraction too unmetrical *stichoi* would be generated, because the requirements of the *elementum breve* would be satisfied by at least some instances of the phonologically heavy syllable (or those of the *longum* by the light). Likewise the duration of syllables is influenced by their position in the larger discourse units such as the sentence and even the paragraph.

(c) Is the criterion of metricality the duration of any syllable when allowance is made for factors covered by (a) and (b) above? Even this is arguable, because there is some evidence to suggest that the actual durations of phonologically heavy and light syllables at a normalized tempo in comparable discourse environments may overlap for certain segmental structures. Although phonetic measurements on typologically comparable languages have not been published, available data indicate the possibility of overlap for such pairs as  $\sigma \tau \rho \ddot{a} - \tau \dots vs. \ddot{\iota} \pi - \dots$ or the like. If sufficient typological confirmation were obtained, such data would establish the complete impossibility of defining the metrically relevant categories in terms of purely durational magnitudes. At all events, even apart from this possibility, it is clear that metricality can only be defined at a considerably abstract phonological level, a conclusion which emphasizes its linguistic basis and contradicts the physicalist view of duration in metre. Thus the model of metrical perception that denies the matching of linguistic with metrical features and assumes direct durational measurement of syllables will have to operate at the above specified level of abstraction, to which it is not entirely appropriate.

#### 5.2. THE METRICALLY RELEVANT LINGUISTIC CATEGORIES

Now that we have discussed the terms in which duration is metrically assessed, let us turn to the other difference between traditional and MR

<sup>27</sup> T. Tarnoczy, "Can the problem of automatic speech recognition be solved by analysis alone?" Rapp. du 5<sup>ème</sup> Congr. Int. d'Acoustique (Liege 1965) 371 ff.

metrics, namely the number of metrically relevant linguistic categories and the number of metrical elements. We shall take the former first.

In discussing the opinions of the MR school in this matter, one is generally faced with the problem that a properly worked out theory explaining the status and number of metrical elements posited is never offered. The main exception is for the parameter theory of West, the presentation of which is, however, overly concise and opaque. But the major difficulty is that no author is willing to explain why the assumption of an additional durational category is the only explanation, or even the best explanation, for the distributional asymmetry he claims to have discovered. The durational explanation is not discussed, it is simply assumed, and this constitutes a petitio principii.<sup>28</sup>

When we examine the various proposed additional metrically relevant categories of linguistic duration, we find that most of them rest either on wrongly posited distributional asymmetries or on real distributional asymmetries which, however, are better explained without assuming additional durational categories. In the simplest situation, the distributional asymmetry claimed is simply not statistically significant: this is the case with the claim that muta cum liquida is not permitted between the vowels of a resolution (Zielinski, Snell, Irigoin, West [note 1], Parker); <sup>29</sup> the small differences between frequencies of muta cum liquida after the vowels of light syllables implementing resolutions and those of light syllables implementing the ordinary breve element are purely random fluctuations due to chance.

In other cases the distributional asymmetry is statistically significant, but due to the simple fact that Greek verse, being written in Greek, must reflect the natural distribution of syllable types within the Greek

<sup>28</sup> For instance West (note 1, 186) writes: "The beginner is told that a hexameter is made up of dactyls... the advanced metrist knows that this is incorrect... There would be no reason why a short final vowel in arsis should make a long syllable with following mute and liquid far more often than in thesis." In fact the "advanced metrist," if he is to deserve his title, should explicitly state why the durational hypothesis should be superior to other conceivable explanations.

<sup>29</sup> T. Zielinski, Tragodoumenon libri tres (Krakow 1925) 150 et passim; B. Snell, Griechische Metrik (Göttingen 1962<sup>3</sup>) 11, 13; J. Irigoin, "Lois et règles dans le trimètre iambique et le tétramètre trochaïque," REG 72 (1959) 75; L. Parker, "Greek metric, 1957–1970," Lustrum 15 (1971) 68.

For discussion of the linguistic and metrical issues involved and a statistical demonstration of the falsity of this claim see L. Stephens, "The myth of the lex de positione debili," Phoenix 29 (1975) 171 ff.

language. This factor (together with Wernicke's Law, which too can be explained without duration) accounts for the distributional asymmetry of CVC vs. CV(C) in the hexameter, which was used as a basis for an additional durational category and metrical element by Irigoin. In such cases, it would in fact be equal distribution that would be evidence for metrical distinctiveness. Anyone positing additional durational categories cannot afford to neglect either the factor of simple statistical significance, or the factor of automatic, reflex asymmetries forced by the statistical structure of the language.

A third large group of additional durational categories is posited by West in his parameter theory (in some instances anticipated by other scholars such as Wifstrand and Snell) on the basis of asymmetrical distributions involving word boundaries, digamma, muta cum liquida, sequences subject to "epic correption" (V#V) and "failure of metrical sandhi" ( $\nabla C \# V = S \# V$ ). In all these cases satisfactory alternative explanations are available that do not entail new durational categories, and in some cases the proposed durational explanation is simply absurd and contradicts banal facts both of language per se and of its use in a traditional Kunstsprache. One of the most striking characteristics of Kunstsprachen in general, irrespective of whether they are implemented in quantitative verse or not, is the coexistence of variants at all linguistic levels, lexicon, syntax, morphology, phonology. Phonological variation originates inter alia in dialect mixture, phonostylistic variation, archaism and its analogical hyper-extensions. There seems no reason to go out of one's way to deny phonological variation (but not variation at other linguistic levels) in, e.g., Homer, especially as, unlike the assumption of phonological variation, the new monolithic durational categories posited in its place are ad hoc and typologically as unique as variation is well attested.

Thus if, e.g., short vowel plus muta cum liquida may implement either longum or breve, while certain other sequences may implement only one and not the other, this is because in the one case it is a heavy syllable and in the other case a light syllable and the poetic language in question accepts this variation. Thus the assumption of an intermediate category of duration, as, e.g., by Snell (note 27, 55), is unnecessary, and

<sup>&</sup>lt;sup>30</sup> Irigoin (note 3). We discuss this fully in "The Homeric hexameter and a basic principle of metrical theory," CP 71 (1976) 141 f.

the same is true for all distributional asymmetries of the form in which the same linguistic sequence implements both the elementum longum and the elementum breve. Since two different syllable types are involved (e.g., V-TR vs. VT-R), there is no longer any distributional asymmetry in these cases, since only light syllables implement brevia and only heavy syllables longa.

However linguistic variation by itself does not account for all of the distributional asymmetries invoked as a basis for new durational categories. The remaining asymmetries all involve word boundary, often acting in conjunction with segmental differences.

West's version of the MR approach to these data is the one presented in the most detail, although, even in its own terms, it is not entirely satisfactory. For instance, it is claimed (note 1, 191) that "the absolute difference . . . should be equal [when] it depends on the same factor;" it is therefore hard to see why the durational difference between digamma and any other consonant should be almost three times as much after a short vowel as after a long vowel (0.55 versus 0.2 difference in West's units). The assumption is rather strange anyway: was the durational difference between w and any other consonant so much greater than that between any two of the other consonants that it could be metrically relevant in the environment VC#— when all other durational differences between consonants are not metrically relevant in that environment? In at least one instance the posited parameters for metrical positions seem to be inaccurately stated: the maximum value for position  $5\beta$  in the hexameter is given as  $U \times V$  (versus  $\times V$  in other  $\beta$  positions), which is contradicted by instances like  $\alpha \pi \epsilon \kappa \rho \nu \psi \epsilon \nu \delta \epsilon$ μοι  $\ddot{\imath}\pi\pi$ ους Il. 11.718, οὐδὲ μὲν ἔργον Il. 9.374, since lengthening before resonants at the appositive boundary, epic correption and VC#F are x. Another weakness is the necessity for ad hoc explanations for data that lead to embarrassing consequences if the durationalist interpretation is applied with consistency: a more accurate statement of categories  $\dot{x}$  (1) and x (2) would have to exclude the consonants in question in a considerable number of individual lexical items:  $\mathcal{F}$  (digamma) in  $\partial_{-}$ ,  $\lambda$  in  $\lambda \epsilon i \pi \omega$ ,  $\lambda \epsilon \chi o s$ , etc. Now it would be absurd to assume that in these words the digamma is longer than in other words such as  $\tilde{\epsilon}\rho\gamma\rho\nu$ , and that  $\lambda$  is shorter in these words than in words such as  $\lambda \alpha \mu \beta \acute{a} \nu \omega$ ; nevertheless, if the durationalist interpretation is not to beg the question by picking and choosing its explananda, it will lead to just such a reductio.

But perhaps the most serious inconsistency lies in the interpretation of word boundary by the MR school, which turns out to be contradictory both from one scholar to another and self-contradictory within the work of one and the same scholar in two major versions of the theory. For Ferdinand Sommer 31 word boundary subtracts duration from final VC, making it too short for the (non-ictus bearing) biceps, whence Wernicke's Law. Therefore, for Sommer a durational interpretation of Porson's bridge is not possible without a contradiction of his basic premise. For Wifstrand (note 4, 33) word boundary both after and before a syllable adds duration to that syllable, a theory which makes the durational interpretation of bridges impossible since word initial syllables would also violate bridges. For Porter<sup>32</sup> the word boundary added duration, thus making long word final syllables so long that they were avoided in the contracted biceps. For Irigoin, on the other hand, biceps restrictions reflect the insufficient duration of the avoided syllable to fill the contracted biceps position: since word-final VC is more strictly avoided than word-medial VC (the latter is in fact not avoided at all (see Devine & Stephens, note 30)), a durationalist interpretation of the word-boundary would have to assume that it subtracted duration; however, for resolutions and Porson's bridge, it is assumed by all MR theories to add duration.

Similarly, in West's scheme, word boundary regularly adds duration, by moving a sequence into the next higher durational category (so VC = U, V#C = U; V = U, V#C = U; but in the case of the sequence short vowel plus resonant or  $\sigma$  an intervening word (or appositive) boundary has the effect of shifting the sequence up 3 categories, from U to V: on the other hand, in the case of the sequences short vowel plus muta cum liquida and long vowel followed by any vowel, word boundary is assumed to subtract duration, shifting the former down to one category lower, the latter to two categories lower. That word boundary should add duration before initial stop plus vowel and subtract it before initial stop plus certain resonants is prima facie phonological nonsense (whereas the explanation invoking the relation

<sup>&</sup>lt;sup>31</sup> F. Sommer, "Zur griechischen Poesie I: die Positionsbildung bei Homer," Glotta 1 (1909) 193.

<sup>32</sup> H. Porter, "The early Greek hexameter," YCS 12 (1951) 1 ff.

between the boundary and the syllable division rests on well founded and solidly documented principles of phonology).

At all events, there is an alternative explanation available for the distributional asymmetries of the hexameter (such as spondee zeugma, Wernicke's Law, epic correption, digamma etc.), and this explanation seems to us consistent and convincing. That the avoidance of word end after contracted biceps in general, and in particular in the coda, is not due to durational factors is widely admitted even by durationalists (e.g., by Snell (note 27, 9–11), and by West (note 1, 190 note 6)). That durational factors are also unnecessary to explain the particular rarity of positional lengthening of VC before digamma and of V before muta cum liquida has not been so widely recognized, even though the alternative explanatory principle was formulated already in 1924 by Thea Stifler,<sup>33</sup> and applied with considerable acumen by Sidney Allen.<sup>34</sup> All word boundaries are avoided after the contracted biceps, and the greater the potential of any particular word-final-word-initial sequence for occurrence elsewhere in the line, the easier it is for that sequence to be avoided at the contracted biceps. Now the categories most avoided (see the list above), which form the basis of many of the posited intermediate durations, are just those categories that offer the greatest latitude for location elsewhere because of the possibility of different syllable weights in other sandhi environments (e.g., VC#V, VC#C) combined in most cases, with additional options due to some inherent variation (e.g., F vs.  $F \rightarrow \phi$ , V # V vs.  $V \# V \rightarrow V \# V$ ).35 This concept of the avoidance hierarchy explains these distributional asymmetries in the hexameter without positing (a) durational distinctions in the language for which there may be no general linguistic or language particular phonological support, and (b) the metrical relevance of the so posited categories.

There remain to be discussed the durational categories posited to account for resolution bridges and Porson's bridge. There have been some recent developments in the field of English metrics that might support the view, probably implicitly held by many metrists, that the

<sup>&</sup>lt;sup>33</sup> T. Stifler, "Das wernickesche Gesetz und die bukolische Dihärese," *Philologus* 79 (1924) 323 f.

<sup>34</sup> W. Sidney Allen, Accent and Rhythm (Cambridge 1973) 290 f.

<sup>35</sup> We discuss this further at note 30.

resolution bridge is motivated by a requirement that the complication introduced into the metrical structure by resolution should not be added to by a boundary mismatch between language unit and metrical unit. Whatever the true explanation, it remains clear that word boundary is a metrically relevant linguistic property. Thus we conclude that of all the linguistic properties for which metrical relevance has been claimed by MR theory, only syllable weight (two values, heavy and light) and word boundary (two values) are in fact metrically relevant. (It should be remembered that there are other metrically relevant phonological properties that have not been under discussion; rules such as the constraints against hiatus or (as in some Latin poets) against the sequence V#sT entail the metrical relevance of certain aspects of the segmental structure of syllables.)

### 5.3. THE METRICAL ELEMENTS

Having established which phonological properties are metrically relevant, we must now turn to the problem of what and how many metrical elements must be posited to produce a metrical "grammar" that will generate all and only metrically acceptable *stichoi*. It will be immediately clear that in this too traditional metrics and MR theory operate with quite different analytical criteria, postulates and procedures.

There are, theoretically, various different ways of organizing the metrically relevant linguistic categories into the metrical elements that are arranged into verse patterns. These different organizations arise from different attitudes to the criteria of "biuniqueness" and "predictability." The criterion of predictability blocks assignment of element status to (sets of) metrically relevant categories that, wherever they occur, may always be derived from other sets by rules specifying the metrical environment to which they are limited. Biuniqueness is simply the requirement that metrical elements correspond one for one with mutually exclusive sets of metrically relevant linguistic categories. Thus, according as these two criteria are or are not admitted into a theory, there will be four principal analyses of the elements of Greek metre and their relation to the metrically relevant categories. In the following discussion it should be kept in mind that all the analyses treated go beyond simply enumeration of facts; they are part of theories

of Greek metre and as such the abstract entities they posit and the additional consequences they imply must be evaluated both with regard to the theoretical structure into which they fit and to all other metrical data, i.e., according to the principle of the hypothetical-deductive method of scientific explanation: no theory can be acceptable from which unacceptable implications may logically be deduced.

- (1) Traditional metrics has implicitly recognized the criteria of biuniqueness and predictability and also the fact that, for reasons noted in (4) below, restrictions of word boundary such as Porson's bridge, are predictable. Therefore it has posited only two elements, *longum* and breve, and has accounted for word boundary restrictions by context sensitive rules. The resulting theory not only accounts for the facts of distribution of the metrically relevant linguistic categories but does so in a way that takes into account the difference in status between the features  $\pm$  word boundary and  $\pm$  syllable weight, a factor discussed below.
- (2) The second type of analysis maintains biuniqueness but dispenses with predictability. It is not represented in the literature, and it is instructive to make the reason explicit. It posits at least 4 metrical elements (one for each syllable weight with and without word boundary) and extensive free variation between elements in all positions. As in all the analyses discussed, such elements are abstract entities connected with observed verse tokens by postulates, but in this case no simplification, much less explanation, is achieved; it is merely a translation of the explananda directly into theoretical entities and rules. Implicitly recognizing that no explanatory advance would be obtained in this way, scholars naturally never entertained this second type of analysis as a serious alternative.
- (3) The third analysis maintains the criterion of predictability but dispenses with biuniqueness. This is the position of Maas, for whom anceps and biceps are elements (overlapping with longum and breve in their linguistic implementations) but for whom word boundary restrictions do not give rise to additional elements. This position is examined below in the discussion of biuniqueness.
- (4) The final analysis dispenses with both biuniqueness and predictability; this would be West's theory modified by the removal of the

falsely posited metrically relevant linguistic categories, a separate parameter being set up for all positions where word boundary is restricted (unless of course other theoretical considerations force a different analysis, see below for discussion). But it should be noted that restrictions on + word boundary are always predictable 36 from context-sensitive rules, except where + word boundary implements a metrical boundary such as stichos end (and in its function as a boundary marker it is hardly an element). Since word boundary is always either predictable or a boundary marker, many metrists have tended not to set up distinctive elements on the basis of word boundary distributions alone. Those who feel that despite its predictability word boundary is the basis for distinguishing metrical elements will have to account for various anomalies in the resulting system. For, as noted above, there is a difference in status between word boundary and syllable weight: -word boundary syllables for instance are never the only implementations of metrical elements, but are always positional variants. Whereas by changing the values of syllable weight in a stichos, a different type of stichos can be produced, only unacceptable instances of the same stichos will result from changing the value of the feature word boundary. The traditional analysis better characterizes the secondary nature of word boundary in metrical structure, and this suggests that the criterion of predictability is a relevant one.

Let us now turn to the criterion of biuniqueness. To start with it will be necessary to make a basic three-fold distinction: this is between linguistic class and metrical element on the one hand, and metrical element and position or environment in the *stichos* on the other. In the

36 Predictability is one of the principles of structural analysis which were worked out thirty or forty years ago; although reference to such principles has for some time been out of vogue, they are relevant and enlightening in this question. Metrical patterns contain two types of redundancy: one type occurs in periodic stichoi and is comparable to the sort of redundancy exhibited linguistically in vowel harmony and the "prosodies." A closer linguistic parallel to the periodic stichos would be a language in which a portion of the lexicon was characterized by reduplication of the entire word (for instance in Snohomish saq'w "fly," saq'wsaq'w "fly slowly in circles" (Hess, IJAL [1966] 350). The other type of redundancy in language structures manifests itself in contextually predictable and therefore non-distinctive or "etic" features, such as aspiration in English stops. Word boundary constraints in Greek metre are predictable in this latter sense and thus not a basis for assuming additional metrical elements. Similarly aspiration is a phonetically relevant category but not the basis for a phonological distinction in English.

terms of traditional metrics, a light syllable is the implementation of the breve in the second foot of the trimeter, and so forth. For the proponents of MR theory, the ideal values, slots, quantity tolerances ARE the elements which occur in different positions in *stichoi*: positions and elements are not different terms for the same thing, because both are needed to produce a unique definition of a *stichos*.

In MR theory, only one element can stand in any position, whereas in traditional metrics alternation, such as anceps and biceps, is allowed. MR theory operates with many metrically relevant linguistic categories, and these categories are not biuniquely correlated (i.e., do not correspond one for one, as in traditional theory) with the metrical elements. To explain the resulting alternations MR theory adopts an analytical principle according to which each different class of alternants (i.e., all the metrically relevant categories that can stand in any metrical position) is defined intentionally as an invariant or metrical "eme," which is described by the property that uniquely characterizes the class and no other class, namely an ideal durational value or an interval containing the durations of the alternants. The appeal of this approach lay in its providing an inherent, direct and general explanation for the existence of alternation, as well as for certain hitherto unclear aspects of metrical structure such as the absence of resolution of the longum in the hexameter.<sup>37</sup> Removal of the biuniqueness constraint allows the metrical pattern to be expressed by single elements with no alternation of elements (sic) in a given position, at the expense of course of multiplying the metrical elements. West, for instance, has approximately a dozen different metrical elements for the hexameter and the Ionic trimeter alone, most of which occur exclusively either in the hexameter or in the trimeter! The reader is reminded of the distinction between metrically relevant linguistic categories and metrical elements; (under the strong ordering condition required for West's durational interpretation, seven metrically relevant linguistic categories—and ten possible linear sequences of them in a single position—the theoretical maximum

<sup>&</sup>lt;sup>37</sup> In fact not so very general, since even apart from "rhythmical" bridges, non-durational explanations will still be required for constraints against, e.g., tribrach plus anapaest in the comic trimeter; this is clearly a non-durational constraint since anapaest plus tribrach is permitted. In fact the very occurrence of anapaests in even numbered feet in the comic trimeter leaves a hole in the parameter of permissible durations (i.e., no spondees) and so requires *ad hoc* explanation in a parameter theory.

number of different metrical parameters, i.e., elements, can be calculated by the formula

$$E_{\max} = \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

where n = 17, i.e., all the possible values from  $\cup$  to  $\pm \frac{1}{2}$ ).<sup>38</sup> This gives a maximum of 153 elements, while the traditional biuniquely constrained binary classification, which West terms "too crude for the detailed understanding of Greek metre," gives just two!

Likewise, on the ideal values approach, additional elements have been

<sup>38</sup> In a purely distributional analysis of metrical positions each distinct, non-empty subset of the set of metrically relevant syllable types and distinct linear sequences of those types will, if it occurs uniquely in at least one metrical position, define a metrical element. Thus if m metrically relevant syllable types are posited and s different linear sequences of them are also posited as metrically relevant, there will be a set of n = m + s distinct items  $\{\sum_i\} = \{S_j\}U\{\langle S_k, S_1\rangle_p\}$  (j = 1, 2, ..., m; p = 1, 2, ..., s), each distinct, non-empty subset of which can define a metrical element. (If sequences of maximum length r can occur in a position the maximum value of s is

$$s_{\max} = \sum_{i=2}^{r} m^{i}$$

Note that not all of these sequences may be possible: e.g., a word medial syllable cannot follow a word final syllable. This sort of redundancy will reduce the actual value of s below that of  $s_{max}$  permitted by the theoretical formula.) The maximum number of such distinct, non-empty subsets of  $\{\sum_i\}$  is  $2^n - 1$  (i.e., the power set of  $\{\sum_i\}$  with the empty set removed). However, the majority of these subsets will not be describable in terms of durational parameter, since they do not necessarily contain all the members of  $\{\sum_i\}$  with "duration" intermediate between the minimum and maximum "durations" of their members. Thus the parameter theory imposes a constraint on a purely distributional analysis of metrical elements. (If in fact intermediate durations are excluded from certain positions, the parameter theory must introduce ad hoc, non-durational explanations, and such parameters with apparent holes in them are not considered distinct, and thus do not increase the number of metrical elements. West, of course, follows this practice.) First of all the number of distinct linear sequences of the relevant syllable types may be fewer in number on a parameter theory. Thus, although "allophonic durational rules" sensitive to linear order are conceivable in a parameter theory (so that  $d(\langle S_i S_j \rangle) \neq d(\langle S_j S_i \rangle)$ ,  $i \neq j$ ), West (note 1, 188) requires that the duration of each syllable type be constant in all environments so that the duration of each sequence equals the sum of the duration of the individual members; linear order is therefore not distinctive in sequences. Thus if sequences of maximum length r are permitted, the maximum number of metrically relevant, distinguishable sequences becomes  $s'_{max}$ 

$$s'_{\max} = \sum_{i=2}^{r} C(m+i-1,i) = \sum_{i=2}^{r} \frac{(m+i-1)!}{(m-i)! i!}$$

To obtain the formula in the text for the maximum number of metrical elements on a

posited to explain away alternation. For instance, the ideal value of anceps was assumed to lie between the ideal value of longum and the ideal value of breve. Such a hypothesis is unfounded both in the framework of physicalist approaches to duration and in the framework for which all durational distinctions below the level of heavy vs. light syllable are irrelevant. For the latter see on Maas in the next paragraph. In the former framework the hypothesis is liable to empirical refutation. This takes the form of deducing a test implication from the "ideal values" hypothesis. It will be shown that this implication is falsified by the data, and thus, by the modus tollens, that the "ideal values" theory cannot be true for positions of alternation. An ideal value, by definition, is unique and does not cover the full range of variation in durations which implement any particular metrical position. Thus the postulation of an ideal value presupposes a statistical preference for linguistic implementations which are closer to it among those which are permitted. If such a preference does not exist, the assumption of an ideal value is unfounded. Now in fact, we know that, ceteris paribus, the ratios obtaining in actual speech between the variously structured heavy and light syllables are not constant. There are longer and shorter varieties, ceteris paribus, of both syllable types. If metricality depended on how well ratios based on phonetic parameters fitted the ideal values of the ratios of pattern elements, it would follow that, according to a common interpretation of anceps, for instance, there would be a tendency for shorter long syllables to be chosen for anceps positions. But on the contrary in actual verses there is no statistical evidence to indicate any such preference.

In any case, we have argued at length above that the multiple metrically relevant categories of duration posited in MR theory are groundless and that the only relevant features are syllable weight and word boundary, the latter being metrically predictable. However,

$$S_1 < S_2 < \cdots < \langle S_i S_j \rangle_n$$

We then allow only those subsets  $\{\sum_j : k \le j \le l\}$  for all choices of upper and lower bounds of the durational indices k and l. The maximum number of such subsets is just the number of ways of choosing substrings of length  $1, 2, \ldots, n$  from the above string, and this is just the sum of the integers from 1 to n.

parameter theory such as West's, we must take the set  $\{\sum_i\}$  of n = m + s' members and put it in strict order according to duration:

even working with two categories (heavy and light syllable) only, it would be possible to apply the MR analysis in terms of parameters or ideal values in order to eliminate alternations of elements. In fact, this is just what the less extravagant versions of MR theory do, as e.g., Maas for anceps and biceps. However, it is a fallacy in structural analysis to assume that alternation between two items necessarily implies a third compromise item as the ideal aimed at: as Lionel Pearson wrote:39 "... as though in a restaurant which offered the alternation of tea or coffee they [some metricians] would be content if offered something in between tea and coffee to drink." The mere fact of alternation in anceps, biceps (and resolution) positions does not require or justify the assumption of a metrical element distinct from the occurring alternating elements, whether the definition of the posited additional element be in terms of a single ideal value or in terms of a parameter of permitted values. (In the latter case, there is a clear difference between a position filled by a single parameter (i.e., metrical element) implemented by a range of linguistic categories and a position filled by an alternation of metrical elements each implemented by its corresponding linguistic category).

Apart from the fact that the posited additional metrical element is superfluous and consequently unfounded, there is a fundamental aspect of alternations that the MR approach quite fails to account for. Considerations of frequency and periodicity (internal responsion) point clearly to one of the responding variants being basic; this fact constitutes the motivation for the traditional process terms such as "resolution" and "contraction;" the tribrach is assumed to replace the basic iamb, etc. In the parameter approach there is no inherent mechanism to capture the hierarchical relationship holding between unresolved and resolved elements, etc.; an additional "marking" component would have to be added to the description, and this component would have to deal with individually defined members of the parameters implementing the positions, i.e., to all practical purposes with longa and brevia, since there is no advantage to rewriting two brevia as a durational value. The parameter analysis has taken an obviously hierarchical structure and flattened it into a single level of representation. The ideal values analysis fares no better. Since a compromise ideal value would be, we

<sup>&</sup>lt;sup>39</sup> L. Pearson, "Catalexis and anceps in Pindar," GRBS 15 (1974) 173 ff.

have argued, unfounded, such a value could only represent a reformulation of a "marking" device in durational terms: yet three values are not needed to express a hierarchy with two members, and, in any case, the ideal value would probably have to be closer to the duration of the more frequent alternant, which is not always the basic one; this is the case with long *anceps* in the trimeter which is more frequent but less basic.

Finally, if the traditional alternations are to be accepted and maintained, then the only metrical elements will be longum and breve, and the only metrically relevant categories will be heavy and light syllable (± word boundary). Such a situation strongly suggests the traditional feature-matching model for the perception of metricality as superior to the MR model positing numerical measurement of the duration of each occurrence of a syllable. Numerical values or ratios of duration would carry superfluous information and therefore would constitute an improbable representation of the psychological organization of the relevant information: it is hardly likely that we would go to the effort of resorting items that come already sorted correctly by our organization of language.

### 6. CONCLUSION

At this point we can see how far the MR and the traditional theories diverge in their conception and models of metricality. In support of the latter there is the fact that feature matching is the most economical and psychologically immediate (direct) model for a theory that maintains biunique correspondence between metrical element and its linguistic implementation. Furthermore biuniqueness and the feature matching model constitute in a specific metrical description the formal and psychological-substantive expressions of the metrical metatheoretic proposition that metrical systems are based on independent, pre-existing, linguistically relevant major classes defined at the level of organization of categorical (non-parametric) feature values. In other words, metre is a patterned arrangement of LANGUAGE units and not a random searching through language for units that possess a property required by some externally structured pattern. It is not clear that the multiple ideal values or parameters that constitute the MR metrical

elements correlate with any phonological classes that are natural and function as a single class in the rules of the language; insofar as they do not, then the fact that they are supposed to constitute equivalence classes for the metre must entail the assumption that the property functioning as the criterion of classification is non-linguistic; and if it is nonlinguistic, it is presumably rhythmical. In other words the motivation for there being just the posited overlapping intervals of duration or ideal values and not others seems not to lie in the language but elsewhere. The fact that MR theory finds evidence for its posited elements in language classes does not change this state of affairs, since the linguistic items are so chosen because, it is assumed, they contain the externally defined classificatory property, and not because the metrical elements are closely and essentially bound to established linguistic feature classes. The fact that traditional metrical theory uses the feature-matching model and MR theory the duration-checking model is symptomatic of this fundamental difference in their conceptions of the nature of metrical patterns.

To sum up: we have argued (1) that the attribution of metrical relevance to linguistic categories other than heavy and light syllable (± word boundary) is unfounded and rests on undetected questionbegging, neglect of basic statistical tests and various shortcomings of language analysis and scientific method in general; (2) that the assumption of metrical elements other than longum and breve is unwarranted, resting as it does in part on the shortcomings under (1), and in part on a mistaken evaluation of the structural significance of alternation in responsion; (3) that the metrical patterns posited as a consequence of (1) and (2) are not metrical at all but really rhythmical, and thus in a sense more in the tradition of Boeckh and Westphal than in that of Hermann. That such an approach could be so widespread in the twentieth century seems to be due partly to the failure of traditional metrics to make an explicit and psychologically realistic case for its transformational approach to responsion and partly also because of a failure to distinguish between a pattern inherent in certain arrangements of language (i.e., metre) and a pattern derived from music or marching or dance into which language is fitted (i.e., an externally imposed durational "tune").



Word-Accent and Melody in Ancient Greek Musical Texts

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# WORD-ACCENT AND MELODY

#### WARREN ANDERSON

The influence of word-accent on melody in the ancient settings of Greek literary texts remains a disputed topic. Approximately forty papyri, inscriptions, and manuscripts ranging in date from the 3rd century B.C. to the 3rd or 4th century A.D. furnish the primary evidence; literary comment begins even earlier, with Aristotle. At the close of the last century, pitch-relationship between text and musical setting became a particular object of analysis and conjecture, spurred by contemporary discoveries of texts containing musical notation. Further examples have since come to light, and only very recently have all the relevant items been gathered together in a single scholarly edition.\*1 To attempt to do justice to the body of existing commentary would require a lengthy volume. What will instead

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# ANCIENT GREEK MUSICAL TEXTS

be attempted here is a statement of basic facts concerning accent and its effect on melodization in the surviving texts, and also of factual or theoretical considerations which may tend to supplement or modify existing views.

One may take as axiomatic the premise that differences in pitch primarily determined the accentual basis of Ancient Greek. This is a universally accepted fact, stated with great explicitness as early as the beginning of the Hellenistic period. Considered structurally, Greek bears notable resemblances to Sanskrit, which the Hindu grammarians always treated as a toneaccented language. It must have contained from the beginning an additional element of stress. Eventually this replaced pitch

as the basis of accentuation; when and how the change took place remains uncertain, but for the present inquiry such questions need not be resolved. A third factor, quantity, determined the nature of classical meters. In turn, the status of any given syllable as long (i.e., consisting of or containing a long vowel, a diphthong, or a short vowel followed by two consonants) or short (i.e., having a short vowel occurring either alone or followed by a single consonant) by normal rules might bear a necessary relation, either intrinsically or through its position, to the possibility of a given kind of accent occurring on that syllable.

So far as musical settings are concerned, the horizontal dimension of syllable quantity clearly has to do above all with rhythmization. The exceptions, however, are worth specifying. A long syllable, especially when it occurs at a pause or during a moment of emotional crisis, may be set to more than one note. This practice was already well established by the early years of the 4th century B.C., when Plato complained about it. Such a setting usually consisted of a brief stepwise sequence; at times the result could be a melisma or, in extreme cases, a trilled figure. Aristophanes, writing in the late 5th century B.C., had already parodied the excessive repetition of a syllable.\*2 He sought specifically to ridicule the musical accompaniments to Euripidean tragedy; his general attack, like that of Plato a generation later, was directed against the innovations of the New Music, detested by conservative thinkers. These innovations have a good deal of significance with reference to melody, and they will be encountered again in the present study. In summary it may be said that, while the roles of stress and quantity must receive their due, the answer to the question of whether any single crucial link existed between a Greek text and its accompaniment must be sought elsewhere, in the accentuation of the words.

As a written form, our term "accent" is an unchanged borrowing of the French derivative from Latin "accentus": ad, in accompaniment to, and cantus (from canere), singing. Since accentus was coined to provide a precise equivalent of prosoidia, its etymology applies with equal precision to the Greek original. Prosoidia appears in a list of terms used by the 5th-century philosopher and poet Critias; it is there defined as a song sung to the accompaniment of the kithara. Its origin thus seems to be specifically and exclusively musical, whereas the English derivative prosody refers to metrics alone. Earlier in the same century, Aeschylus had used it figuratively to mean mode of address.\*3 A very different kind of figurative usage char-

acterizes its appearance in a well-known passage (399a5-8) of Plato's Republic, written around the year 388 B.C. The Platonic Socrates approves the use of the Dorian mode (harmonia) to express the phthonggoi and the prosoidiai of a brave man under stress. As a prose usage, the first of these plural terms refers to various types of sound. To take the case of only one author among several, Plato employs it to describe semivowels, or again the notes of the lyre. In poetry as in prose, the ambiance of phthonggos proves to be clearly and strongly musical. For the passage from the Republic, the standard Greek-English lexicon (Liddell-Scott-Jones) proposes the meaning "tones," which will serve well enough. With reference to the occurrence of prosoidiai here, the same source gives voice-modulations as a definition. Despite its lack of grace, this seems suggestive in the right way - once it is realized that no technical sense of modulation (the interchange among different modes or genera, which properly was called by the name metabole) can have any relevance. The choice of prosoidia, like that of its companion noun, shows Plato's deliberate employment of terms which can describe either speech or music, according to the context. His selection cannot be faulted: it enables him to encompass both provinces, to suggest the song-patterns of emphatic speech in a tonically accented language.

Elsewhere in the dialogues, Plato comments on the limitless range of sounds expressible by the human voice; here he seems to be referring to specific portions of this spectrum. Factors other than pitch must be involved, since the resource of the seven-stringed kithara - Plato will not allow the aulos to be heard in his ideal commonwealth - went far beyond what could ever have been required simply for paralleling the system of accentuation. The choice of one mode over another constitutes another proof: it would have been meaningless under such a limitation, whereby nothing beyond a universally accepted set of pitch-levels could have been in question. Plato speaks of high and low with reference to pronunciation, coming no closer than this to a specialized approach. It was his pupil Aristotle who contributed the first recorded instance of prosoidia in the sense of pitch-accentuation of syllables. \*4 In the course of a development which he himself had initiated, the term was extended during the early centuries of the Christian era well beyond its strictly proper limits. It came to include quantity and breathing (in this context, the presence or absence of initial aspiration) and also to denote the written accent marks.

Leaving aside lesser variations, one may say that these marks

were the acute, grave, and circumflex. \*5 Devised in Alexandria around the year 200 B.C., they were employed only intermittently and for certain preestablished purposes until the 6th century A.D., when the practice of including them became invariable. French has accurately preserved their ancient written forms (^^), except for the alteration of the circumflex from angular to curved in the late classical period. This change did nothing to alter its nature as a combination of acute and grave on the same syllable. The curved circumflex serves as a reminder, however, that the tonic levels of Greek were necessarily realized through pitch-glides - a supple interchange of high and low rather than a rigidly angled one. A minimal syllable, taken to consist of a short vowel, provided the basic speech-unit. Its Greek name was chronos, meaning time or (on occasion) delay. In the central decades of the 19th century, the great German philologist Hermann substituted the Latin term "mora," which primarily denotes delay; this has been used ever since. Thus a long vowel or diphthong consists of two morae. As an example, the circumflexed initial syllable of doron, meaning gift, is considered to contain two short o vowels with an acute accent on the first and a grave accent on the second (66). Dorou, the genitive singular of this same noun, has an acute on the first syllable. Here the two morae may have been accented in exactly the opposite order, with grave preceding acute (00). This theory is not clearly supported by the extant musical texts, however, and the alternative of a sustained acute (óó) may be the correct explanation. Considered broadly, the system of subdivision into morae reveals a greater degree of tonemic variety within the language itself than could have been suspected from a knowledge, however assured, of Greek orthography and written accentuation.

The different kinds of voice movement involved in the separate activities of speaking and singing were made clear by Aristoxenus, a pupil of Aristotle who possessed a unique command of both the theory and the practice of music. Acknowledging the existence of "a kind of speech-melody (logodes ti melos)," he nevertheless lays down his distinctions with great preciseness. He explains that in spoken Greek the movement from one pitch to another is continuous (syneches, meaning literally keeping together); this is the pitch-glide mentioned earlier. Song, on the other hand, involves movement by intervals (diastematike, from diastema, meaning interval especially in music): the voice leaps from one level to another, pausing perceptibly on each, whereas in speech it does not seem to become stationary even at the extreme high or low points. \*6

Within its limits, Aristoxenus' account is a persuasive one. It disappoints the modern student of Greek accent and melodization only in that it mentions extremes of pitch-glide without specifying them. A knowledge of the gamut that pertained to acute and grave, coming from so comparatively early a period, would have had particular value. Unfortunately, no recorded statement on the matter was made until the close of the 1st century B.C. It came from the scholar-critic Dionysius of Halicarnassus, in a treatise entitled "On Literary Composition." "The melody of speech," he declares, "is measured by a single interval, as nearly as possible that which is termed a fifth. [The voice] does not rise more than three whole tones and a semitone toward the acute, nor does it fall more than this intervening space toward the grave." Although the writer makes it quite clear at the outset that he is speaking of one interval and one only, some scholars have accepted an interpretation of his words that involves belief in a pair of fifths measured upward and downward from a supposed mean tone. The passage will not bear this meaning; Dionysius goes on to emphasize the variety of intervals employed in music, as a part of his contrast between music and speech. \*7 His meaning here can only have been that the acute accent involved a maximum rise of something very much like the musical interval of a fifth, while the fall toward the grave accent traversed, at most, the same amount of musical space. (It should perhaps be mentioned that absolute pitch has nothing to do with Greek pitchaccent, any more than with the melodic pattern of Greek music.)

One notes that Dionysius is careful not to claim any simple identity between the intervals embodied in word-accent and those of actual melody. Also, he presents his quasi fifth as a maximum: it is for him neither an absolute nor even, so far as we can tell, a norm. His words leave room for pitch-distinctions between identical forms which have the same accent but different meanings. More importantly, they may be intended to take account of variations in the level of the grave accent occurring on the final syllable of a word in place of an This substitution was normal, though not absolutely invariable, unless such a word came at the end of a pause within the sentence or actually concluded it. Grave accents may also have had a varied level in long words, where secondary accentuation (as in English) seems a reasonable possibility. Finally, the mysterious "middle" accent twice mentioned by Aristotle is best explained as such a secondary use of the grave. Another passage from the same author disproves the theory, which is still being put forward, that it is merely a different name for the circumflex. \*8

Dionysius' comments can be fitted to much of the scattered and difficult evidence from antiquity concerning Greek accentuation; the inclination to accept him as guide is likely to be felt with considerable force. This remains true despite possible causes for misgiving: he was writing three centuries after the death of Aristotle; the mode of speech that interested him was that of the orator, though his comments on accentual pitchlevels seem to apply to ordinary speech (the boundaries of his definitions are not always drawn with sufficient sharpness); and he vigorously championed Atticism, the "pure" style of Greek rhetoric that had found its last notable exponents during Aristotle's final years. Furthermore, we do not really know how accurately his knowledge enabled him to speak for the Hellenic age or even the Hellenistic; neither can we estimate the nature and effect of possible archaizing, however well intentioned, in his comments on pitch-accent. Similar questions arise with regard to an even later statement by Aristides Quintilianus.\*9 Writing in the 2nd or 3rd century A.D., he speaks of a type of voice-movement which lies between the two described by Aristoxenus, proceeding neither continuously nor by intervals. Since he goes on to specify it as (very literally) "that in which we make our readings of poetry," it must have been clearly identifiable as speech rather than music, while the accentuation involved less pitch-glide and greater stability of interval level than normal speech. Again, there may well be difficulty in supposing that by the time of Aristides normal speech still contained any strong element of pitch-accent. It remains to be seen whether the arguments presented here can satisfactorily account for these potential objections.

To turn from the generalizations of ancient theorists to the actual musical remains brings no easy, immediate solution for the problems which have been acknowledged. The most recent editor of the approximately forty extant fragments finds that in a majority of them — namely, in the two Delphic Hymns dating from 138 and 128 B.C., and in fifteen others of still later date — the following tendencies may be observed:

- (1) Whether they have the acute, the grave, or the circumflex, the accented syllables of polysyllabic words are higher than the unaccented syllables of the word in question, or are at least not lower.
- (2) Syllables with the grave accent are not higher than the accented syllables of the following word.
- (3) A melisma on a syllable bearing a circumflex accent takes a downward melodic direction. \*10

As the field of examination is narrowed, it becomes possible to find support for a far more extensive and intricate set of rules (if so strict a term may be allowed). Precisely this kind of elaboration was undertaken after the discovery of the Delphic Hymns, which show an impressively large number of instances in which word-accent seems clearly to have determined or modified the melodic contour. The argument has been put forward that the Hymns represent extreme conservatism and thus may well preserve the techniques of composition which prevailed until the close of the 5th century B.C. Existing evidence affords neither proof nor disproof in a conclusive degree. What the musical fragments do make clear is that regular observance of word-accent in melody did not characterize settings which can be dated, with a fair measure of probability, to the 3rd or 2nd century B.C.

The same lack of correspondence is to be seen in the fragmentary setting of lines (338-44) from a chorus of the Orestes, a highly melodramatic tragedy by Euripides which was first staged in 408 B.C. It chanced that Dionysius of Halicarnassus singled out other lines (140-42) from this very play as an example of melody ignoring word-accent.\*11 Evidently he believed that he had before him a text which reproduced the original musical setting. There is also the point that the Orestes fragment which has come down to us does not reflect the Alexandrian manuscript tradition (unconcerned with musical settings, unfortunately) in its rendering of the text. The deviations, for which various explanations have been suggested, may possibly indicate that it constitutes evidence for Euripides' own time and specifically for the final period of his life. This was also the period during which the innovations of the New Music had become common practice, although the conservatives never accepted them. No evidence concerning any earlier time can be brought to bear usefully on the particular problem which is under consideration here. The history of the relationship between accent and melody would appear to be not only discontinuous but illogical, as one looks back on the particulars of its development. In hopes of relieving somewhat this discomforting situation, the present study will be concerned in what follows with factual or theoretical considerations which may contribute to a historical rationale, and finally to a presentation of the broad outlines of the pattern as it may have developed.

First, there is universal agreement that word-accent must be explained partly within the frame of reference provided by strophic responsion. The latter term denotes the metrical identity (allowing for occasional substitutions) of strophe with

antistrophe in choral lyric. Stanza A is matched, so to speak, by stanza A¹. When essentially the same pattern of long and short syllables was repeated with a new text — meaning a new sequence of pitch-accents — the melody of the strophe could hardly have been repeated without ignoring word-accent. A more meaningful question is whether the initial melodic setting, that of the strophe, ignored it. The evidence of the Orestes fragment, part of an antistrophe, suggests that such was the case; but neither here nor anywhere else is a satisfactorily broad basis for generalization apparent.\*12 One cannot be sure that strophe and antistrophe did not have separate melodies, and it is perhaps venturesome to go past the procedures of the extant settings in framing conjectures about the positive or negative relation between accent and melody.

Fortunately it proves possible to obtain positive results from these settings. In the case of works that go back to the 3rd or 2nd century B.C., when the two factors of accent and melody tend to coincide (under the three general rules listed earlier, and with varying additions) the text appears not to be strophic. The melodic setting of such texts was "through-composed," with no concern for strophic responsion. We know that the abandonment of a metrical structure based on strophe and antistrophe ranked among the most notorious accomplishments of the New Music. Conversely, where the accentual and melodic factors differ markedly, it is certain in one instance and likely in several others that the texts are strophic choral lyric. The latter category includes several very brief fragments employing a vocabulary that suggests tragic diction. These fragments violate the relation between word-accent and melody to a startling degree. \*13

A second consideration involves tonal emphasis within a spoken semantic context. Here the parallel instance of Chinese may be suggestive. No other major language, ancient or modern, is thought to involve pitch-accent to such a vital degree; yet the Mandarin dialect can still be understood even when a foreigner does not use any of its four tones, providing the other requisites of spoken usage are correctly observed. Again, the speech-pattern allows emphasis only on the one preeminently significant semantic unit in a sentence. All the others are neutral, so far as pitch is concerned. It would appear that in spoken Chinese contextual suggestion can compensate for the absence of clearly sounded pitch-distinctions to a notable degree. If this is true of a language with an unusually limited number of morphemes and a very high degree of phonemic differentiation, the power of context should apply still more force-

fully to the kind of pitch-accented language represented by Ancient Greek; here instances of formal identity occur much more rarely, and the control of meaning by pitch-level constitutes the exception rather than the rule. Still more significant for Greek is a comment by the author of a standard work on Chinese music: "The moment words, that is, the neumes ["sheng," the bases of directional tonal movement, usually called tones] as expressed through the words, are not pronounced separately but in a sentence, [the] set or standardized form of tonal expression as to pitch, key, rhythm and interval, is almost always varied both in speech and song. As a result of the influence of adjacent syllables even the directional movement form is sometimes disrupted." Another scholar has well summarized the situation by pointing out that actual pitch movement in Chinese is the sum of tone and intonation; the absence of the latter element produces monotony. \*14

Traditional Chinese vocal music of the kind which emphasized the four word tones (strikingly similar to their Greek counterparts) produced unenterprising melodies. Although these melodies were not wholly determined by the rise and fall of the tone-patterns, the link was close enough to preclude reasonable freedom of composition. An escape mechanism existed, however. As in the Baroque aria, embellishments were thought to be not only permissible but indeed mandatory. They also provided an auxiliary means of stressing the presence of the tones. Up to 1956 at least, this whole tradition had been ignored by most of the contemporary song writers in mainland China. While traces of a classical concern with relating melodic movement to tone can be discerned in the work of a few composers, the great majority made no effort to achieve any such accommodation. Some musicologists have taken the position that traditional songs, on the other hand, do offer grounds for comparison with those of other cultures having tone-languages. One study, centered on Chinese texts and involving the languages of Togo and Dahomey, sets forth a list of rules concerning accent and melody. At the same time, it is made clear that these rules do not readily apply to strophic composition. \*15 The comment may be an understatement, in view of the difficulties which stand in the way of a belief in melodic as well as metrical responsion, where strophic texts are concerned.

One hesitates to set forth even the most tentative historical scheme of the relation between the Greek pitch-accents and melodization; yet certain suggestions may be worth venturing. It is generally believed that until about 400 B.C. the musical

settings of Greek poetry were marked above all by simplicity. So far as several important factors are concerned, especially modality and rhythm, the literary evidence supports such a belief. It does not, however, necessarily warrant the assumption that melodic contour reflected the rise and fall of the ac-Those Hellenic writers who, like Aristophanes and Plato, were protesting against the inroads made by the New Music, certainly implied or expressly stated that the music should follow the text, as it used to do in former times. \*16 What they neither state nor even imply is that such fidelity involved the pitch-accents. These are conspicuously absent from their accounts of what was, in fact, considered relevant. The possibility of selective pitch emphasis, together with the manifest power of context, must be taken seriously into account. There is also the fact, already noted, that the tonal range of the kithara extended well beyond what would have been necessary for any close equivalence to standard pitch-levels. The same excess of capacity characterized the aulos, and to a far greater degree. \*17 While the old Hellenic music did apparently have modal and rhythmic simplicity, there is little reason to suppose that it also embodied any close correspondence between accent and melody. If Dionysius of Halicarnassus had a reliable score of the Orestes, and if he was generalizing legitimately from it, quite the opposite of such correspondence prevailed. What he says is perfectly clear: Euripides' disregard of word-accent in melody was typical. The weakness of attempts to explain away his statement has been all too evident.

The revolutionary innovations of the later 5th century B.C. established the New Music, usually thought of as a kind of universal solvent. In this description the noun predicates accurately; the adjective overstates. Much of the old simplicity was undoubtedly done away with. The dithyramb, a choral hymn honoring Dionysus, furnished the most celebrated example. It ceased to be composed in strophic form; its melodic line was now drawn out to a great length, with incessant modulation and rhythmic instability. The follower of Aristotelian method who recorded these facts in the Musical Problems could not see past mimesis as an explanation. \*18 His dutiful use of approved theory ignores the fact that music had now begun to assert clearly its domination over the text, which in some cases had become little more than a libretto. There are Euripidean choruses which one can hardly read without suspecting that they were designed as vehicles for the musical setting; and by Euripides' time the setting was likely to be the work of someone other than the tragic poet. Substitution of random meters

for strophic composition was a highly significant move in the direction of artistic realism. For better or worse, the melody was now free to follow the accentual contours of the text more closely — with a more faithful mimesis, to use the terms of the pseudo-Aristotelian source. Whether or not it did so, there is at present no means of knowing; what seems to be evidence on this point proves to be irrelevant or ambiguous. The whole issue may have seemed unimportant to the Greeks themselves.

A number of hymns and other compositions which date from the Graeco-Roman period or later do show a consistent positive relationship between accent and melody. This consistency must be regarded as archaism. The texts in question come from a period sufficiently late so that pitch-accent was no longer employed in a consistent and knowledgeable manner by the ordinary man, in ordinary speech. Stress was increasingly assuming the dominant role; it now appears to have been more closely allied with certain aspects of the accentual patterns in Hellenic Greek than most scholars have supposed. \*19 The shift took place slowly, over a considerable period; its chronology is still being argued. Yet it did take place, and as stress gained an ever greater control, pitch became more and more a matter of ceremonial, of solicitous formality controlled by literary critics and rhetoricians. Tradition dies hard: it was not until the 4th century of our era that stress-accented poetry made an appearance in the Christianized remnants of Greek literature.

This does not mean that one should feel obliged to accept the extreme view that probably "spoken Greek did not sound very unlike a modern European language in point of melody" and that "the chief difference may have been that the rise and fall in pitch was a function of the word rather than, as in English, of the sentence."\*20 It is more likely to mean that, so far as accent in the Hellenistic period is concerned, the situation resembled that in Belgrade just before the Second World War. The musical accent of Serbo-Croatian was still distinctly noticeable in the speech of older persons, and it was preserved by educated persons and on the stage. In the spoken language, however, it was becoming increasingly vestigial rather than real, influenced in the direction of stress by Serbian dialects. \*21

The conclusions which have been put forward in the present brief study of a formidably intricate problem may seem radical, considering the incomplete state of the evidence. Because of this incompleteness, they contain an indispensable element of conjecture. They nevertheless accord, to a considerable degree, with the scholarly consensus that has been gathering force for the last several decades. Essentially they represent an attempt to enlarge somewhat the extent of that consensus. Much more work remains to be done: perhaps the greatest need of all is for a painstaking thematic analysis of the music in the extant fragments.\*22 Until this and other tasks have been accomplished, it may be useful to have argued that there is no reason to assume the existence of any organic relationship between accent and melody in the ancient settings of Greek texts.



#### REFERENCES

- Egert Pöhlmann, DENKMÄLER ALTGRIECHISCHER MUSIK (Nürnberg: Verlag Hans Carl, 1970). In 1899 Carl von Jan published, as an appendix to his SCRIPTORES MUSICI GRAECI (Leipzig, 1895), all of the specimens of Greek music which were then known to exist and which were believed to be genuine. The entire work has recently been reprinted (Hildesheim: Georg Olms, 1962).
- Plato, Laws 812d3-4; Aristophanes, Frogs 1314, 1348. The use of the phrase New Music is a modern echo of a Hellenic and Hellenistic distinction; it occurs with some frequency in studies of Greek music.
- 3 Critias: in Hermann Diels, ed., DIE FRAGMENTE DER VORSOKRATIKER, rev. Walther Kranz, 11th ed. (Zürich: Weidmann, 1964), 88B57; Kathleen Freeman, tr., ANCILLA TO THE PRE-SOCRATIC PHILOSOPHERS (Oxford: Basil Blackwell, 1962), p.161. Aeschylus: Fragment 299. Herbert W. Smyth's translation of prosoidia as song accompanying words (GREEK GRAMMAR, rev. Gordon M. Messing [Cambridge, Mass.: Harvard University Press, 1956; first published 1916], p.37, sec. 151) is impossible. In a musical context the initial element pros, whether occurring as an independent preposition or (as here) in composition, always denotes the act of accompanying singing on an instrument.
- The various considerations cited above in the text make it difficult to accept Pöhlmann's statement in GRIECHISCHE MUSIKFRAGMENTE (Nürnberg: Verlag Hans Carl, 1960), p.24, that in Republic 399a phthonggous refers to the choice of the appropriate mode and prosoidias to a "naturalistisch-expressive" manner of declaiming the text. Plato on the human voice: its infinite range, Philebus 18b8-9; high and low (oxytes, barytes) within this range, ibid. 17c12, Timaeus 67b6, Cratylus 399a6-b4. The latter passage constitutes the first reference in Greek literature to accentuation; it deals with the change from grave to acute that takes place when the phrase Dii philos, meaning dear to Zeus, is combined to form the proper name Diphilos. Prosoidia in Aristotle: one occurrence in the Poetics, 1461a22, and eight in the minor treatise Sophistic Fallacies (Sophistici elenchi); see the index of significant terms in W.D. Ross, ed., Aristotelis Topica et Sophistici elenchi (Oxford: Clarendon Press, 1958). The most substantial discussions of prosoidia are found in sections 166bl-9 and 177b35-178a3 of this work. In 177b3 Aristotle extends his use of the term to include aspiration (citing the nouns oros and horos, which have the same accentuation). See also below, Reference \*8. Our English term prosody derives from the extension to quantity such rationale as it possesses.
- On the general subject of the Greek accents see J.P. Postgate, A SHORT GUIDE TO THE ACCENTUATION OF ANCIENT GREEK (Liverpool and London: University Press of Liverpool and Hodder & Stoughton, 1924); Eduard Schwyzer, GRIECHISCHE GRAMMATIK, 4 vols., 3rd ed. (München: C.H. Beck, 1959-60), Vol. I (1959; first published 1939), 372-95, esp. 372-76; Edgar H. Sturtevant, THE PRONUNCIATION OF GREEK AND LATIN, 2nd ed. (Philadelphia: Linguistic Society of America, 1940); Pöhlmann, MUSIKFRAGMENTE, pp. 17-29, and DENKMÄLER, p. 140 with nn. 1-3; also the bibliographies in Schwyzer and Pöhlmann.

- 6 ELEMENTS OF HARMONICS (Harmonica Stoicheia) 1.9, pp.101.19-102.7, 102.20-25 Macran; text and translation in Sturtevant, pp.96-97 and n.8. On Aristoxenus' reference to the speech-melody (1.18), see Pöhlmann, MUSIK-FRAGMENTE, p.18.
- 7 De compositione verborum, ch. 11, sec. 58-59, pp.40.17-41.1 Usener-Radermacher; text and translation in Sturtevant, pp.97-98 and n.9. The variety of intervals as greater in music: ibid., secs. 62-63, p.41.13-18 U.-R. The introductory comments and footnotes of W. Rhys Roberts, ed. and trans., DIONYSIUS OF HALICARNASSUS ON LITERARY COMPOSITION (London: Macmillan, 1910), pp.41-43, 126-29, are still useful on some points.
- The "middle" accent in Aristotle: Rhetoric 1403b24-29, Poetics 1456b30-34; texts and translations in Sturtevant, p. 99 and nn. 11-12. Pöhlmann, DENK-MÄLER, p. 140, n. 2, champions the old view that it is identical with the circumflex; but in Sophistic Fallacies 179a14 Aristotle treats the circumflex as identical with the acute in that both are oxys, meaning high-pitched. For a heterodox discussion of these passages and of others bearing on other aspects of accent, see George Young, HOMER AND THE GREEK ACCENTS (Reading: Poynder & Son, 1930), pp.1-16. Though the work is eccentric and has gained little attention, it raises awkward questions that still tend to be evaded.
- De musica, 1.4, pp.5.24-6.7 Winnington-Ingram. Some scholars hold that Aristides took up Aristoxenus' idea of speech-melody. See W.B. Stanford, THE SOUND OF GREEK (Berkeley and Los Angeles: University of California Press, 1967), p.28. The work includes a general Appendix on pitch-accent, pp.157-60 with seemingly arbitrary conclusions regarding the grave accent. Aristoxenus, however, was not seeking to apply the idea of speech-melody to any intermediate type. He seems to be referring to ordinary speech, not to a "public" mode of delivery practiced by the rhetorician. This fact makes it much less easy to discount, as applying only to rhetorical pitch, some of the references made by his teacher Aristotle (above, Reference \*8). The role that rhetoric may have played does complicate analysis, however, when we come to Dionysius and Aristides.
- 10 Pöhlmann, DENKMÄLER, p. 140.
- De compositione verborum, ch. 11, secs. 63-64, pp.41.18-42.14 U.-R. See the discussion of the Orestes fragment by Pöhlmann, DENKMÄLER, pp.80-82, and the literature cited by him. A brief review of various assessments of Dionysius' comments and also of the fragment itself is given by the present writer in ETHOS AND EDUCATION IN GREEK MUSIC (Cambridge, Mass.: Harvard University Press, 1966), p.233, n.61. I there assented to the widely held belief that Dionysius, in a later passage of his treatise (ch. 19, sec. 130, pp.84.19-85.3 U.-R.), refers to the necessity of melodic correspondence between strophe and antistrophe. In an extensive study, "Musikalische Aspekte der attischen Tragödie," which is to be published shortly in BEITRÄGE ZUR MU-SIKWISSENSCHAFT and which he was kind enough to let me see in typescript, Dr. Lukas Richter of the Akademie der Wissenschaften has now shown that in using both melos and meloidia here, Dionysius is distinguishing between genus and melody as the proper meanings, respectively. Roberts makes no distinction between them in his translation. One must conclude that Dionysius postulates unity for the genera of strophic poetry but not for the melody. On the New Music see Richter, "Die Neue Musik der griechischen Antike," ARCHIV FÜR MUSIKWISSENSCHAFT, 25 (1968), 1-18, 134-47.

- 12 The lines of the antistrophe, 338-44, equate with 322-28 in the strophe. In 323 tinyme[nai] as in 338 matéros, the melodic sequence runs counter to the word-accent; 322 haimatos and 389 [katolo]phyromai both have the high note on the accent. The same is true of 343 katéklysen but not of 327 maniados, while just the reverse situation applies to 340 em brotos as against 324 [kathike]teúomai.
- The fragment from a tragedy dealing with the hero Ajax (No. 32 in Pöhlmann's DENKMALER) deserves special mention. The papyrus in which it occurs is late, dating from the 2nd or 3rd century A.D. The Greek text evidently originated a good deal earlier; it has even been attributed to Aeschylus. Every one of the nine intact polysyllables in this fragment (lines 16-19) violates Pöhlmann's first rule (above, p.192). An added line, numbered 23, contains no violations at all a fact which makes it difficult to accept Pöhlmann's claim (op. cit., pp.101, 103) that accentuation, as one of "numerous similarities," binds this line closely to 16-19.
- Mandarin intelligible even without tones: Yuen Ren Chao, "Tone, Intonation, Singsong, Chanting, Recitative, Tonal Composition, and Atonal Composition in Chinese," in FOR ROMAN JAKOBSON. . . , ed. Morris Halle and others (The Hague: Mouton, 1956), pp.52-59; see p.52. Variation when tones are pronounced in sentence context: John H. Levis, FOUNDATIONS OF CHINESE MUSICAL ART (New York: Paragon Book Reprint, 1963; reprint of 1st ed., published 1936 in Peking), p.23. Pitch movement as tone plus intonation, absence of intonation as productive of monotony: Chao, p.53. A number of bibliographical references concerning accent and melody in Chinese music were kindly provided by my colleague, Professor Shou-hsin Teng.
- The comments on Chinese music are based on Chao's statements, pp.57-58. Lindy Li Mark and Fang Kuei Li, "Speech Tone and Melody in Wu-Ming Folk Songs," in ESSAYS OFFERED TO G.H. LUCE. . . , ed. Ba Shin and others (Ascona, 1966), 1:167-86, reported ten years later, on the basis of field recordings from a district in Kwangsi, that the relation between speech tone and musical pitch proved to be more a matter of convention than an absolute, although slurred pitches in music often reflected the tonal contours of speech. Gerald Strang had suggested in 1945 that the portamento or glide in Chinese vocal music may reproduce language inflections: see his "Sliding Tones in Oriental Music," BULLETIN OF THE AMERICAN MUSICOLOGICAL SOCIETY, 8 (1945), 29-30. Fritz A. Kuttner ("China: The Hidden Relations Between Language and Music," MUSICAL AMERICA, 70/2 [January 15, 1950], 5, 40, 72), who taught in Shanghai for a time, takes the same general view but applies it to Chinese instrumental music. It is clear that he considers a number of the conclusions reached by Levis (above, Reference \*14) to be overly hasty. His own experience indicated little or no attention was paid to word intonations in Chinese folk tunes; the intelligibility of the text was largely neglected. Kuttner does believe that in an earlier stage of musical culture language had an influence on melody. Here he is in accord with Chao (p.57 and n.6) and Levis (cf. p.10). This brings up a difficulty which has not, perhaps, been taken into account by ethnomusicologists: the difference between primitive cultures and the earlier stages of a highly sophisticated culture such as that of dynastic China, for example the T'ang dynasty with its magnificent poetry. The analysis of Chinese texts on the basis of previous research into Ewe folk songs is found in Marius Schneider, "La Relation entre la mélodie et le langage dans la musique chinoise," ANUARIO MUSICAL (Barcelona), 5 (1952), 62-69; see p.62, n.1 and also below, Reference \*17.

- 16 So Plato, Republic 399e11-400a2, 400dl-4, Laws 812dl-e6.
- 17 On the ways of expressing speech by the use of instruments alone, see Dalia Cohen, "Palestrina Counterpoint: A Musical Expression of Unexcited Speech," JOURNAL OF MUSIC THEORY, 15 (1971), 84-111, esp. 95-96 and References \*15-24. To the references there given may be added the article by Schneider cited above (Reference \*15) and also his "Tone and Tune in West African Music" (ETHNOMUSICOLOGY, 5/3 [1961], 204-15) and "Zur Trommelsprache der Duala" (ANTHROPOS, 47 [1952], 235-43). The latter treatment includes nontonal as well as tonal languages of Africa.
- 18 Problems, 19.15, pp.86.1-87.7 Jan (see above, Reference \*1).
- 19 See W. Sidney Allen, "Correlation of Tone and Stress in Ancient Greek," in TO HONOR ROMAN JAKOBSON. . . , 3 vols., I (The Hague and Paris: Mouton, 1967), 46-62. His arguments center about the post-tonic fall and proceed from Jakobson's idea of accent-pattern as a total "contonation" that takes into account the falling pitch-glide. The important type of accent proves to be the circumflex, which according to Allen is correlated with stress in a great majority of cases. It thus already "met the conditions of a stress accent" before the latter actually became dominant. See now also Alan H. Sommerstein, THE SOUND PATTERN OF ANCIENT GREEK (Oxford: Basil Blackwell, 1973).
- 20 Sturtevant, p. 97.
- 21 Schwyzer, 1:394.
- Pöhlmann has not undertaken analyses of this kind in either of his studies. Examples of what might be achieved appear throughout R.P. Winnington-Ingram's Appendix II ("Melody and word-accent") in FRAGMENTS OF UNKNOWN GREEK TRAGIC TEXTS WITH MUSICAL NOTATION, ed. S. Eitrem and Leiv Amundsen (Part I: Text) with Winnington-Ingram (Part II: Music) (Oslo: A.W. Brøgger, 1955), pp. 64-73. His discussion was undertaken too early to include several papyrus discoveries (Nos. 38-40 in Pöhlmann, DENKMÄLER) which Professor Winnington-Ingram himself was to publish in collaboration with E.G. Turner and O.M. Pearl during the following decade. It is nevertheless indispensable for any study of the present subject. See also his survey, "Ancient Greek Music 1932-1957," LUSTRUM, 3 (1958), 5-57 and esp. 41-43, on melody and word-accent.



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### THE HOMERIC HEXAMETER AND A BASIC PRINCIPLE OF METRICAL THEORY

#### A. M. DEVINE and LAURENCE STEPHENS

THIS article addresses itself to two fundamental issues in Greek metrics, one theoretical and the other methodological. The first is the most basic question that can be raised in the description of any metrical system: what and how many are the constituent, structural elements of that system, and what is their relation to the language employed for the system? The second concerns the logic of statistical arguments adduced in the solution of the first. Specifically we give a detailed examination of Irigoin's claims for the Homeric hexameter, the clearest and most cogent presentation of the currently favored metrical doctrine that there is a multiplicity of metrical elements in Greek corresponding to postulated differences in the phonetic duration of phonemes and syllables. We begin by noting this doctrine's divergence from the theory of the ancient  $\mu\epsilon\tau\rho\iota\kappa oi$ , then set forth briefly the logic underlying hypotheses such as Irigoin's, and point out the improbability of the system posited, which would be quite unparalleled among the metrical systems of the world. Following a complete presentation of the data on which Irigoin's claims rest, in a detailed exposition of the logical and mathematical principles involved, we assess the statistical arguments for a multiplicity of metrical units, and demonstrate that they are unfounded and circular, and that the data at issue are merely the automatic reflex of Greek linguistic structure when it is fitted to independent (nondurationally motivated) aspects of metrical structure. This result is achieved by the following steps: we first argue that Wernicke's Law is an important factor in accounting for the data, but that it cannot be the only factor. We then isolate and quantify the remaining, externally motivated, metrical and linguistic factors and are thereby able to confirm the null hypothesis (that durational factors are not involved) and thus the invalidity of Irigoin's claims and assumptions. We conclude that there is no basis for such recent attempts to refute the traditional analysis, dating to antiquity, that in Greek there are only two metrically relevant distinctive elements, longum and breve, which stand respectively in a one-to-one correspondence to linguistically heavy and light syllables. We emphasize that statistical evidence obtained from metrical sources cannot be used directly to establish any given hypothesis about metrical structure. Such evidence must be interpreted against the values that would result from the interaction of the distributional properties of the language and the independent requirements of the meter.

#### 1. INTRODUCTION

The oldest tradition in the study of Greek meter, dating to the ancient  $\mu\epsilon\tau\rho\iota\kappa o\iota$ , recognizes two and only two distinctive metrical elements in a

one-to-one ("biunique"1) relation to linguistic syllables. Among modern metrists, by contrast, there has been a growing propensity to seek a multiplicity of metrical elements corresponding to (certain categories of) syllabo-segmental durations. The latter approach, which traces its ancestry ultimately to the  $\sigma \nu \mu \pi \lambda \dot{\epsilon} \kappa \rho \nu \tau \dot{\epsilon} s^2$  (Aristid. Quint. 38. 15 W-I) rather than to the μετρικοί, we find, for example, at the beginning of the last century with Seidler—"Harum igitur litterarum pronuntiationem habuisse aliquid coniicias, unde communis regulae violatio commode veniam inveniret"3—and more recently, for example, in Sommer, <sup>4</sup> Zielinski, <sup>5</sup> Snell, <sup>6</sup> Porter, <sup>7</sup> West, <sup>8</sup> and Irigoin. Although the authors are generally less than explicit about the practical consequences of such statements for the structure of the meter, they are basically claiming that the traditional category of heavy or long syllables contains a number of subcategories ("shorter longs" and "longer shorts"), and that, because the poet chooses between them in an apparently nonrandom manner, these subcategories are metrically relevant. This is obviously a hypothesis of the most fundamental import for the nature and structure of Greek meter, though one which is immediately suspect because, as we shall see (§ 3), it is at variance with a universal principle of metrical systems (whether quantitative, stress-based, or tone-based). For the most part the justification for the proliferation of metrical elements has been sought in various zeugma (bridge) phenomena and presumed restrictions on the form of resolutions.<sup>10</sup> This approach has generally been applied in an ad hoc manner alongside the standard assumption of longum and breve, and perhaps only West and Irigoin have recognized its full import. West's durational interpretation of a variety of phenomena, including even dialect

- 3. A. Seidler, De versibus dochmiacis, pars posterior (Leipzig, 1812), p. 385.
- 4. F. Sommer, "Zur griechischen Poesie, I: Die Positionsbildung bei Homer," Glotta 2 (1909): 145-240.
  - 5. T. Zielinski, Tragodoumenon libri tres, vol. 2 (Cracow, 1925), pp. 150 et passim.
  - 6. B. Snell, Griechische Metrik<sup>3</sup> (Göttingen, 1962), pp. 11-13.

  - B. Sheh, Greensche Metrik (Gottingen, 1902), pp. 11-13.
     H. Porter, "The Early Greek Hexameter," YClS 12 (1951): 1 ff., esp. 20.
     M. West, "A New Approach to Greek Prosody," Glotta 48 (1970): 185-94.
     J. Irigoin, review of L. Rossi (see n. 11), GGA 217 (1965): 228 ff.

<sup>1.</sup> For the term see N. Chomsky, "The Logical Basis of Linguistic Theory," Proc. IX Int. Congr. Ling. (The Hague, 1962), pp. 951 ff.; for its applicability to metrical theory see Devine and Stephens, "The Abstractness of Metrical Patterns: Generative Metrics and Explicit Traditional Metrics," *Poetics* 16 (1975): 411-30.

<sup>2.</sup> The essential difference between the μετρικοί and the ρυθμικοί is succinctly summed up at Funaioli, Gramm. Rom. Frag., 304. 132: "Rhythmici temporibus syllabas, metrici tempora syllabis finiunt." For the ancients, those who maintained the distinction between the two approaches were called χωρίζοντες; those who conflated the two, συμπλέκοντες. Cf. Arist. Quint. 38. 15 W-I: Οὶ μὲν οὖν συμπλέκοντες τῆ μετρικῆ θεωρία τὴν περὶ ρυθμῶν τοιαύτην τινὰ πεποίηνται τὴν τεχνολογίαν. οὶ δὲ χωρίζοντες ἐτέρως ποιοῦσιν. None of the modern scholars mentioned in this article is a rhythmist either in the ancient sense or in the sense that L. Pearson, "Catalexis and Anceps in Pindar," GRBS 15 (1974): 171-91, could be called rhythmical; they rather continue the tradition of the  $\sigma \nu \mu \pi \lambda \epsilon \kappa \rho \nu \tau \epsilon s$ .

<sup>10.</sup> Particularly with regard to muta cum liquida and other intervocalic segments, where it is wholly unwarranted and arises from simple fallacies in logic and statistics: see Stephens, "The Myth of the Lex de positione debili and a Fundamental Question in Metrical Theory," Phoenix 29 (1975): 171-80.

variations, is at variance with well-established principles of linguistics and metrics. Since Irigoin, on the other hand, presents a clear and sophisticated argument based on entirely new evidence, our discussion here will be specifically directed to his treatment.

#### 2. EVIDENCE OF DIONYSIUS

Irigoin, in his review of a monograph by L. Rossi,<sup>11</sup> attempts to justify the assertions of the rhythmists reported by Dionysius of Halicarnassus concerning the  $\ddot{a}\lambda o\gamma os~\mu a\kappa \rho \dot{a}$  of the dactylic hexameter and the nature of the cyclic anapest. It is to be regretted that what he has to say did not appear in a format more commensurate with its fundamental importance. According to the rhythmists, as Dionysius is usually thought to be telling us, the longum of the cyclic anapest is not durationally equal to that of the normal anapest, and similarly the longum of the dactyl is distinct from (shorter than) true long (= biceps?):

Οὶ μέντοι ἡυθμικοὶ τούτου τοῦ ποδὸς τὴν μακρὰν βραχυτέραν εἶναί φασι τῆς τελείας, οὐκ ἔχοντες δ' εἰπεῖν ὄσω, καλοῦσιν αὐτὴν ἄλογον. ἔτερὸς ἐστιν ἀντίστροφον ἔχων τούτω ἡυθμόν, δς ἀπὸ τῶν βραχειῶν ἀρξάμενος ἐπὶ τὴν ἄλογον τελευτῆ· τοῦτον χωρίσαντες ἀπὸ τῶν ἀναπαίστων κυκλικὸν καλοῦσι. [Comp. 70. 17 U-R]

Irigoin's stated purpose is merely to support, with unusually detailed linguistic and statistical arguments, the rhythmists' claim for the  $\mu \alpha \kappa \rho \dot{\alpha} \beta \rho \alpha \chi \nu \tau \dot{\epsilon} \rho \alpha$ , but in order to do so he makes much stronger claims of his own, the validity of which is quite independent of anything found in Dionysius. Irigoin offers evidence in the form of statistics, produced by his pupil Miss Seguin, showing different frequencies of syllable types (e.g., CVC, CV, etc., and subcategories thereof) in the *longum* and contracted *biceps*, from which he concludes: "la structure phonétique du longum est différente de celle du biceps."  $^{12}$ 

This assertion was, perhaps, less critically received than it might have been, because many scholars labor under the biceps fallacy and therefore are predisposed to see in such data a welcome confirmation of the distinction between biceps and longum as they interpret it. This fallacy is a variant of the anceps fallacy, which we have exposed in a recent paper. In brief, the fallacy assumes that metrical transformation rules cannot produce merger of underlying distinctive elements; specifically in the case of biceps it assumes, if ever different, then always different. An adequate theory of Greek meter, on the other hand, must operate with underlying representations of the metrical structure (e.g.,  $- \sim \sim$ ) and surface representations of the same (e.g.,  $- \sim$ ) which are derived from them by transformational rules (e.g., contraction rule:  $\sim \sim \rightarrow -$ ). The linguistic syllables are mapped onto the surface representations (e.g., heavy syllable  $\rightarrow$  long metrical

<sup>11.</sup> L. Rossi, Metrica e critica stilistica (Rome, 1963).

<sup>12.</sup> Review of Rossi, p. 230.

<sup>13.</sup> Devine and Stephens, "Anceps," GRBS 16 (1975): 197-215.

element at the surface level). This framework reveals in exactly what respects longum and contracted biceps are identical and in what respects they are not, and it shows how a transformational rule can perfectly well produce a merger. Therefore, whether longum and contracted biceps are distinct at the surface level, too, cannot be decided by preconceived constraints on what a metrical transformation rule can do. If they are to be distinct at the surface level, they must have different linguistic implementations. Irigoin thinks he has found the necessary linguistic evidence. Where a single surface element (-) has been posited, Irigoin now assumes two or more unspecified, durationally based, distinctive elements, the implementation of which is achieved through distinctive frequency distributions of the different durational classes of heavy syllables. 14 The merits of the statistical argument we discuss in the rest of the paper: meanwhile the reader should note that the claim reported by Dionysius (as Irigoin understands it) would automatically follow from the validity of Irigoin's statistical argument, but the reverse is not the case, since rhythmical contrasts do not necessarily imply correlated metrical contrasts, 15 as the ancients themselves recognized (cf. Aristoxenus at Psellus 8 [Pighi]: των δέ χρόνων οι μέν είσι ποδικοί, οί  $\delta \hat{\epsilon} \tau \hat{\eta} s \hat{\rho} v \theta \mu o \pi o i (a s i \delta i o i)$ .

#### 3. LOGICAL ALTERNATIVES

In evaluating the differences between the frequency distributions of the various types of syllables (henceforward these differences discovered by Irigoin and Seguin will be referred to as I-S differences), it is vital to remember that theoretically there are two possibilities. Either they are due to deliberate implementation of a characteristic of the metrical structure, as Irigoin claims, or they are merely the automatic result of fitting one given structure (the Greek language, or, more precisely, the Homeric Kunstsprache) with another given structure (the dactylic hexameter as it is traditionally conceived). In the latter case the I-S differences necessitate no new theoretical construct, and the traditional binary distinction between longum and breve should be maintained. It is precisely the latter crucial alternative that Irigoin has failed to consider, and which we shall here show to be the case.

<sup>14.</sup> A system that might be viewed as parallel in the functioning of frequency distributions, but which in fact remains quite different from that suggested by Irigoin, because there are only two metrically relevant units, is found in the Finnish Kalevala, where the underlying trochaic pattern is realized by distinctive frequency distributions of the two, prominent and nonprominent, metrical units. It should be clearly understood, however, that in the Kalevala meter there are only two metrically distinctive types of syllable (though their specification is rather complex) and not four or more, as Irigoin would have for Greek. For a statistical approach to metrical analysis see, e.g., Jiři Levý, "Mathematical Aspects of the Theory of Verse," in L. Doležel and R. Bailey, eds., Statistics and Style (New York, 1969), pp. 95–112; and Jerzy Woronczak, "Statistische Methoden in der Verslehre," Poetics, vol. 1 (The Hague, 1961), pp. 607–624. A transformational approach is always a theoretical possibility, and the current controversy between traditional and generative metrics comes down largely to a choice between the two alternatives: see further Devine and Stephens, "The Abstractness of Metrical Patterns."

<sup>15.</sup> Dionysius' report refers to rhythmical units, Irigoin's to metrical ones. The difference is as obvious as it is basic: for further discussion see our forthcoming monograph, New Approaches to Greek Metrics.

#### 4. THE DATA

Within the category of heavy syllable, Irigoin distinguishes about twenty syllable types, which are intended to reflect supposed durational gradations. These are, for the purposes of statistical sampling, at any rate, then grouped into three classes (CVC, CV, and CVC);16 we are not told whether these classes correspond precisely to what is relevant to the meter or this reduction is only for convenience: "dans la pratique certains de ces types se confondent."<sup>17</sup> The durational hierarchy thus established for the three categories is not impossible from a general phonetic point of view, although its literal interpretation may involve gross oversimplification, since acoustic measurements in a number of languages suggest that diverse factors over and above the mere segmental structure of the syllable condition syllabic duration. However, it would be most unusual for such differences to function as the distinctive properties of metrical elements. Indeed, examination of a large number of the metrical systems of the world indicates a universal rule that metrical elements are always implemented by a single feature with only two values: a binary categorization (in Greek, syllable weight which is either heavy or light). 18 That Greek meter should be an exception to this universal rule is another of the very strong claims that Irigoin does not appear to realize that he is making.

The statistics that Irigoin presents are drawn from the first four feet of the hexameter (from a sample of one hundred lines of Odyssey 14), and show a significantly higher frequency (more than chance) of the shorter types of syllables (broadly  $C\breve{V}C$ ) in the longum than in the contracted biceps, and conversely a significantly higher frequency of the longest types ( $C\breve{V}C$ ) in the contracted biceps than in the longum (no figures are given for  $C\breve{V}$ , but it is reported as behaving comparably to  $C\breve{V}C$ ). Irigoin gives data explicitly

16. C denotes any consonant,  $\check{V}$  any short vowel, and  $\bar{V}$  any long vowel or diphthong. (The representations refer, of course, to post-sandhi forms: see n. 24.) It has long been recognized for Greek, and our examination of the quantitative metrical systems of a number of languages tends to confirm, that the presence or absence of any number of syllable initial consonants is irrelevant to syllable quantity. Also irrelevant is the presence or absence of more than a single final, closing consonant in a syllable with a short vowel. Since this is the case and since Irigoin accepts these principles for his third category of syllables (long vowels or diphthongs followed by a final consonant), we may make a concession to readability and tolerate a slight ambiguity in our notation. A syllable initial C is understood to indicate zero or any number of consonants, whereas a syllable final C indicates at least one final consonant, since the absence of any consonant is clearly marked by omitting the C (as in  $C\bar{V}$  as opposed to  $C\bar{V}C$ ).

For the purposes of the metrical data discussed here, we must distinguish between, on the one hand, what we may call full-word boundary and all greater boundaries, and, on the other, what we may call appositive boundary and all lower ranking boundaries. We use the symbol # for full-word and greater boundaries (an example would be  ${}^{\prime}A\rho\gamma\epsilon\iota\omega\nu\#\kappa\rho\dot{\alpha}\tau\epsilon\epsilon\iota$ ) and the hyphen - for lower ranking boundaries, including no boundary (examples would be  $\epsilon\iota_s$ - $\delta\dot{\epsilon}$ - $\tau\iota_s$  or  $\dot{\alpha}\sigma$ - $\pi\iota\delta\alpha$ ). In our notation the final syllable of  ${}^{\prime}A\rho\gamma\epsilon\iota\omega\nu\#$  will be represented as -CVC#, and the syllable  $\dot{\alpha}\sigma$ - of  $\dot{\alpha}\sigma$ - $\pi\iota\delta\alpha$  as -CVC-. For an attempt to provide a principled account of boundary problems in Greek on the basis of metrical evidence, see our "Greek Appositiva: Towards a Linguistically Adequate Definition of Bridge and Caesura" (forthcoming).

17. Review of Rossi, p. 229.

18. For a discussion of metrical feature systems, see Devine and Stephens, "The Abstractness of Metrical Patterns," pp. 411 ff.

only for  $C\bar{V}C$  (which for him excludes syllables ending in a resonant  $\rho$ ,  $\lambda$ ,  $\mu$ ,  $\nu$ ) and for  $C\bar{V}C$ . His data are given in Table 1.19

TABLE 1

	C <b>Č</b> C	CVC
longum of the dactyl longum of the spondee contracted biceps	24.0% 19.5% 8.0%	3.5% 7.5% 15.0%

We have checked Irigoin's sample and can confirm that in fact the contracted biceps does prove to differ from each of the two longa more than chance alone would explain. In a statistical sense, the difference is significant: it remains to determine whether it has any metrical significance.

We shall depart from Irigoin's procedure in that we operate with only three basic categories (CVC, CV, CVC) and in that we class CV + resonant with CVC rather than with CV. The substance of the I-S difference is not materially affected by these changes in procedure. We should note, however, that, owing to changes in the classification of CV + resonant, the difference between the longum of the spondee and the contracted biceps becomes greater than that between the longum of the dactyl and the contracted biceps. In our work we added samples from a number of books of the Iliad and the Odyssey and from various later authors to provide a diachronic check. A remarkable consistency was found from Homer to the twentieth century: Table 2 gives the I-S differences for the longum of the dactyl (Dact. L.), the longum of the spondee (Sp. L.), and the contracted biceps (Sp. B.). This very consistency, however, is a cause for doubting that durational considerations have anything to do with the observed I-S differences, for it seems unlikely that McKenzie especially, whose translation of the Aeneid passage into Homeric hexameters appeared in 1910,20 should have so faithfully reflected the as yet undiscovered Homeric I-S differences. Of course, McKenzie may have unconsciously internalized the differences from his reading of Horner, but the suspicion remains that his respect of the I-S differences is merely the automatic reflex of other factors that were well known at the time.

We next examined the first four feet of the hexameter independently in order to check the stability of the I-S differences throughout the line. Table 3 presents the data for the *longum* of the spondee (L) versus the contracted *biceps* (B) for all spondees in the first four feet of *Odyssey* 2, along with the chi-square.<sup>21</sup> Clearly the difference is greatest in the fourth foot, and nearly

<sup>19.</sup> Review of Rossi, pp. 229-30.

<sup>20.</sup> R. McKenzie, Vergil, Aeneid II. 268-385 Translated into Homeric Hexameters, Gaisford Prize for Greek Verse (Oxford, 1910).

<sup>21.</sup> The chi-square test is a statistical procedure for determining whether two (or more) samples (here of longum and biceps) are significantly different, i.e., different to an extent greater than would arise through chance variation in samples of the same population. The value  $\chi^2$  is a measure of the deviations of the relevant frequencies in the samples. In this case it is calculated by adding the ratios obtained when the squares of each of the differences between the observed and expected number of occurrences (not the percentages) of the respective syllable types are divided by the

nonexistent in the first. An interesting fact emerges from the data collected for Table 3. When the *biceps* of the first foot is compared to the *biceps* of the fourth, if we accept for the moment Irigoin's premise that I-S differences reflect durational differences, we find that the first contracted *biceps* is significantly shorter than the fourth (the differences in the syllable frequen-

TABLE 2

		CŤC	CV	CVC	Number counted
Homer Iliad 3, 12; Odyssey 1, 14	Dact. L. Sp. L. Sp. B.	43.74% 46.30% 27.24%	48.43% 41.25% 62.06%	7.83% 12.45% 10.72%	1086 }514
Hymn to Aphrodite	Dact. L. Sp. L. Sp. B.	38.40% 44.53% 26.28%	49.05% 46.71% 64.96%	12.55% 8.76% 8.76%	263 }137
Aratus	Dact. L. Sp. L. Sp. B.	40.07% 44.07% 27.97%	52.84% 51.96% 68.46%	7.09% 4.24% 3.39%	282 }118
Nonnus 2	Dact. L. Sp. L. Sp. B.	37.99% 50.00% 23.47%	49.02% 32.65% 65.31%	12.99% 17.35% 11.22%	502 } 98
McKenzie	Dact. L. Sp. L. Sp. B.	39.07% 50.00% 27.55%	47 .35% 32 .65% 63 .27%	13.58% 17.35% 9.18%	302 } 98

TABLE 3

		C <b>V</b> C	CV	C∇̄C	Number of spondees counted	<i>χ</i> <sup>2</sup>
Foot 1	L B	39.60% 38.93%	52.35% 53.69%	8.05% 7.38%	149	0.08
Foot 2	L B	40.74% 29.63%	47.62% 58.73%	11.64% 11.64%	189	4.91
Foot 3	L B	32.85% 32.85%	51.09% 58.39%	16.06% 8.76%	137ª	3.61
Foot 4	L B	46.10% 23.40%	39.72% 66.67%	14.18% 9.93%	141	21.13

<sup>&</sup>lt;sup>a</sup> The number of spondees in the third foot in Book 2 (64) is too small for a reliable estimate; it has therefore been supplemented with a sample from *Od.* 14.

corresponding expected number of occurrences: it is the sum of the ratios (observed — expected)<sup>2</sup>/ (expected) for each syllable type. The expected values are calculated on the hypothesis that the samples are the same, and are based on the combined sample. For tables such as those in the text (which have two degrees of freedom) a value of  $\chi^2 = 5.99$  is considered to indicate a significant difference. For a detailed explanation of chi-square, see G. Herdan, *The Advanced Theory of Language as Choice and Chance*, Kommunikation und Kybernetik, 4 (New York, 1966), pp. 36 ff. and 404 ff.

cies give  $\chi^2 = 8.13$ ). We shall not speculate whether Irigoin's procedure would require increasing yet again the number of durationally distinct metrical elements to account for the above interpodic differences.

#### 5. INDEPENDENT METRICAL FACTORS IN I-S DIFFERENCES

We have pointed out above that, to establish the desired significance for the I-S differences, it is necessary to demonstrate that they are not merely the reflex of independent, long-known metrical and/or linguistic factors. We proceed a fortiori to examine the fourth foot, where the I-S differences are the most pronounced. Even an elementary familiarity with the hexameter would suggest that these differences must somehow be related to Wernicke's Law, that in spondee-ending words positionally lengthened CVC (-CVC#C-) is avoided in the *biceps* of the fourth foot (and probably in the *biceps* of other feet also—"Extended Wernicke's Law"). This metrical phenomenon, by definition, contributes to the overall I-S difference, especially in the fourth foot; yet, unfortunately, Wernicke's Law is a factor omitted from any consideration in Irigoin's brief treatment.

#### 6. WERNICKE'S LAW

Two questions have to be answered. (1) Is Wernicke's Law motivated by the same factors that are assumed to motivate the I-S differences in general, i.e., is it durationally motivated, or independent of duration? (2) Is Wernicke's Law by itself responsible for the I-S differences in the fourth foot or is it only a contributing factor? The former question we shall discuss in this section, the latter in § 7.

A durational basis for Wernicke's Law has been posited in the past most notably by Sommer.<sup>22</sup> Stifler<sup>23</sup> sought to rebut Sommer's theory by pointing out inter alia that Wernicke's Law is part of a more general tendency to avoid all word boundaries at contracted position 8 (the spondee zeugma), and that the final syllable types eliminated by Wernicke's Law (-CVC#C-, -CV#CC-) are just those that become light syllables in different sandhi conditions.<sup>24</sup> Obviously there are more locations in the verse available for words that vary in their quantitative shape (e.g., those ending in CVC) than for words whose shape is constant (e.g., those ending in CVC). Furthermore, almost by definition, a word can be more easily avoided in a given metrical position accordingly as there are other positions in which it can occur. Therefore, it is easier to satisfy the restrictions on word boundary at contracted position 8 for variable word shapes than for fixed word shapes. Viewed in this light, it is clear that Wernicke's Law is a reflex of the spondee zeugma and consequently will have the same motivation, so that it requires no additional assumptions about the metrical acceptability of different

<sup>22. &</sup>quot;Zur griechischen Poesie, I," esp. p. 193.

<sup>23.</sup> T. Stifler, "Das Wernickesche Gesetz und die bukolische Dihärese," Philologus 79 (1924): 323. 24. Sandhi (from Sanskrit sam + dha, "put together") is a term covering the different phonological modifications that words undergo when they come into contact. Such modifications in Greek are traditionally classified as, e.g., elision, aphaeresis, crasis, epic correption, and, of course, the well-known rules of syllabification in the metrical line of which we are speaking here.

syllabic durations. In fact Wernicke's Law is really only the limiting case of a much more general hierarchy of avoided syllable types. This line of argument is fully exploited by W. Sidney Allen,25 who sets up a hierarchy of syllable types: -VC,  $-\alpha\iota/o\iota$ ,  $-\eta/\omega$ ,  $-\eta/\omega$ , -VC. The more frequently a syllable is measured light antevocalically (a value which increases from right to left in the preceding hierarchy), the rarer its appearance in contracted position 8 (the frequency of occurrence increases from left to right). That is, VC before a vowel is light with only very rare exceptions, and it is almost totally absent anteconsonantally in contracted position 8; similarly, -ai/oi are the most frequently correpted long nuclei and are correspondingly rare in 8; and so on. The central section—vowels and diphthongs—of Allen's hierarchy is the familiar epic correption hierarchy. 26 The precise, inverse relation between the two hierarchies is completely accounted for by the fact that the more frequently a final syllable is correpted or shortened, the greater its potential for occurrence elsewhere in the line becomes. We suspect<sup>27</sup> that a similar avoidance hierarchy will appear as a consequence of the parallel avoidance of word boundary in contracted positions 4 and 6 (Extended Wernicke's Law). Of course, final heavy syllables of polysyllabic words are less frequent in position 4 than in 8 (4.72% as opposed to 17.30%, calculated from E. O'Neill's data<sup>28</sup>), so that the overall frequency of CVC, -ai/oi, etc., will be affected to a correspondingly smaller degree in position 4: this correlates well with the smaller values of the I-S differences observed in position 4 (see Table 3).

However, the durationalists would probably consider this hierarchy to be rather one of phonetic duration, word boundary being avoided the more insistently, the shorter the duration of the final syllable in question. Now potential occurrence elsewhere would have to be invoked in any case if, as claimed by Stifler, word boundary at position 8 tends to occur more frequently when the offending word could not be transposed to the end of the hexameter because that position is already occupied by another word of the same or comparable shape, or by a fixed formula. Consequently, the introduction of a durational element into the explanation constitutes a loss of economy, unless it can be argued that duration, too, has an autonomous place in the explanation of Wernicke's Law because it provides the motive for the overall avoidance of word boundary at contracted position 8. Thus the durationalists would presumably argue that all final long syllables are shorter than medial and initial long syllables, or that word boundaries reduce the duration of a preceding syllable. But this is an unprovable hypothesis for Greek and invalid as a linguistic universal. In any case most durationalists claim that the complex of boundary phenomena has exactly

<sup>25.</sup> W. Sidney Allen, Accent and Rhythm (Cambridge, 1973), p. 290.

<sup>26.</sup> P. Chantraine, Grammaire homérique, vol.  $1^3$  (Paris, 1958), p. 89. Note that the avoidance hierarchy in position 8 should affect the frequency of  $C\bar{V}$  as well.

<sup>27.</sup> We did not actually complete the gathering of the relevant statistics: previous authors offer only subjective reactions.

<sup>28.</sup> E. O'Neill, "The Localization of Metrical Word Types in the Greek Hexameter," YClS 8 (1942): 103-178. Word shapes relevant to positions 7 and 8 must be separated and their frequencies in those two positions converted to percentages.

the opposite effect.<sup>29</sup> Thus, Porter<sup>30</sup> explains the spondee zeugma under discussion here as a result of the fact that long finals are "more effectively long than other syllables"; and, in West's<sup>31</sup> durational scheme, word end adds length to both short and long syllables. Irigoin himself had adopted a similar position for the trimeter bridges,<sup>32</sup> without apparently realizing that, if finals are longer, the claim that the contracted *biceps* is preferentially implemented by longer longs, so far from explaining why word boundary is avoided at contracted position 8, would in fact require the reverse (i.e., high frequency of final syllables) for its validity. The durationalists thus are caught in a contradiction. Until the durational effect of boundaries can be assessed on grounds that are neither circular nor ad hoc, any account involving durational assumptions must remain scientifically inadequate.

If duration is removed as a general motive for the avoidance of word boundary at contracted position 8, it becomes, as noted above, superfluous as a motive for Wernicke's Law. But in that case, a satisfactory general motive has to be found to replace duration. A simple theory is avoidance of false coda, i.e., avoidance of line final patterns internally within the line. This theory has the virtue of providing a unified explanation for both the spondee zeugma and Hermann's Bridge, but it is less apt for comparable phenomena in earlier feet and only partially accounts for the fifth foot. The (statistically unassessed) permissibility of a major syntactic break after contracted position 833 is perhaps not a great problem for the false-coda theory, since it is remarkable how often the distinction between simple word boundary and higher ranked syntactic boundaries is disregarded for metrical purposes. As far as position 8 goes, the permissibility of major syntactic breaks is adequately accounted for by Allen's stress theory.<sup>34</sup> (Allen assumes that there is a metrically relevant linguistic stress which is assigned from word end to alternate heavy syllables or matrices of two light syllables according to phonological context.) Both Allen's theory and the false-coda theory present some difficulties, but at least neither suffers the mutual contradiction implicit in the durational explanation of the laws of Wernicke and Porson. (If only one of these laws is to be durationally motivated, it is more likely to be Porson's than Wernicke's. Even then the segmental structure of syllables would remain irrelevant for Porson's Law.)

7. THE CONTRIBUTION OF WERNICKE'S LAW TO THE OVERALL I-S DIFFERENCE In this section we shall give a quantitative analysis of the contribution of Wernicke's Law to the overall I-S difference between position 7 and con-

<sup>29.</sup> The two boundary classes relevant here are discussed in n. 16 above.

<sup>30.</sup> Porter, "The Early Greek Hexameter," p. 20. For durational allophones of pre- and post-boundary positions, see I. Lehiste, "Juncture," Proceedings of the Fifth International Congress of Phonetic Sciences (Basel, 1965), pp. 172-200, and E. Gårding, Internal Juncture in Swedish, Travaux de l'Institut de phonétique de Lund, 6 (Lund, 1967).

<sup>31.</sup> West, "A New Approach to Greek Prosody."

<sup>32.</sup> Irigoin, "Lois et règles dans le trimétre iambique et la tetramétre trochaïque," REG 72 (1959): 74.

<sup>33.</sup> H. Ehrlich, Untersuchungen über die Natur der griechischen Betonung (Berlin, 1912), p. 160. 34. Accent and Rhythm, pp. 286-95.

tracted position 8. The essential reasoning behind this analysis is as follows: if Wernicke's Law and the spondee zeugma constitute the only causes of the I-S difference, then the distribution of syllable types in position 8 must be nothing more than a modification of the distribution in position 7 produced by Wernicke's Law and the spondee zeugma. In other words, those factors contributing to the frequency of CVC which are not subject to Wernicke's Law and the spondee zeugma should be the same in position 8 as in position 7, and those factors that are subject to Wernicke's Law and the spondee zeugma in position 8 should be so modified that their contribution to the frequency of CVC in position 8 is decreased enough to account for the I-S difference. This hypothesis constitutes the null hypothesis, in contrast to the assumption that other factors are involved. In order to check the null hypothesis, we shall isolate those factors which are subject to Wernicke's Law and the spondee zeugma and devise a means of calculating the decrease in the frequency of CVC produced in position 8 by Wernicke's Law and the spondee zeugma. Then we shall compare the actually observed I-S difference with the difference that is projected on the null hypothesis. If the projected difference is not significantly different from the observed I-S difference, then Wernicke's Law and the spondee zeugma will be shown to be the only causes of the I-S difference. Specifically we shall show that, for a large sample, the actual difference in CVC frequency between position 7 and position 8 is 20.91%, whereas Wernicke's Law and the spondee zeugma by themselves would yield a difference of 6.44%. Therefore, although Wernicke's Law and the spondee zeugma make an important contribution to the I-S difference, they cannot be the only factors involved.

Monosyllables. Before we begin to calculate the effect of Wernicke's Law and the spondee zeugma on the frequency of CVC, we must take note of an important statistical property of the Greek language which combines with Wernicke's Law to reduce the frequency of CVC in position 8. This property concerns monosyllables, and consequently a separate examination of the syllable-type frequencies in the various types of monosyllables is a necessary prerequisite for calculating the contribution of Wernicke's Law and the spondee zeugma to the I-S difference.

The great majority of monosyllables are, of course, either prepositives followed by reduced "juncture" ( $\kappa a l$ -, o b-,  $\dot{\epsilon} \nu$ -, etc.) or postpositives followed by full "juncture" ( $\gamma \dot{a} \rho$ ,  $-\mu \dot{\epsilon} \nu$ ,  $-\tau \iota s$ , etc.), only a few being full phonological words ( $\beta \hat{\eta}$ ). Postpositives and phonological words will be very nearly eliminated from position 8 by the spondee zeugma, and those few that remain will be subject to Wernicke's Law, so that CVC types will be eliminated. This means that only prepositives are left as a source of CVC syllables among the monosyllables of position 8. The statistical property of the Greek language referred

<sup>35.</sup> Junctures are phonologically relevant categorizations of morphological and syntactic boundaries. The term is currently out of favor in linguistics but worth preserving: see our article, "Boundaries in Phonology, a Preliminary Analysis," in A. Juilland, ed., Linguistic Studies Presented to Joseph Greenberg (Saratoga, Calif., 1976). We may speak here of full juncture, occurring at word and greater boundaries, and reduced juncture, occurring at appositive and lesser boundaries. For the sake of brevity we shall call syllables followed by full juncture "junctural syllables" (S# in our notation: cf. n. 16). In accordance with Wernicke's Law and certain properties of the Greek language discussed in the text, for the purposes of frequency calculations we shall also distinguish nonjunctural syllables of polysyllabic words (S-) from monosyllables (mono, S) and prepositives (pre).

to in the preceding paragraph is that in prepositives the frequency of  $\mbox{C}\mbox{V}\mbox{C}$  is much lower than the average frequency of  $\mbox{C}\mbox{V}\mbox{C}$  in all types of monosyllables. In fact, as an extensive sample of prose (excluding the article) shows, only 20% of prepositive monosyllables have  $\mbox{C}\mbox{V}\mbox{C}$  structure. Thus, in qualitative terms, the spondee zeugma serves to decrease the frequency of  $\mbox{C}\mbox{V}\mbox{C}$  in position 8 by selecting from the class of all monosyllables an overwhelming majority that have a very low frequency of  $\mbox{C}\mbox{V}\mbox{C}$ . Wernicke's Law makes its contribution by removing all  $\mbox{C}\mbox{V}\mbox{C}$ 's from such nonprepositives as may occur.

We must now analyze the situation quantitatively. As we have seen, for monosyllables there are three relevant properties: (a) that of being prepositives; (b) that of not being prepositives; and (c) that of having CVC structure. Prepositives, nonprepositives, and CVC monosyllables will each have their own frequency in position 8. Each of these frequencies can be viewed as a simple probability: e.g., the chance of finding a prepositive in position 8 is simply the fraction of all syllables in (a large sample of) position 8 that are prepositive. Thus, if we take a large sample of position 8, say, n syllables (and therefore n hexameter verses), and find m prepositives in that sample, the probability of a prepositive in position 8 is m/n. Likewise, if we find k CVC syllables (whether monosyllables or parts of polysyllabic words), then the probability of CVC in position 8 is k/n. (These are, of course, simply the relative frequencies.) Now both prepositives and nonprepositives may have CVC structure, so that each type will have its own frequency of CVC in the language. Frequencies of this latter kind can be viewed as conditional probabilities. For example, if we choose a large sample of prepositives only (from a prose text), say, r prepositives, and out of those r prepositives we find that s have  $\check{\text{CVC}}$  structure, then s/r is the conditional probability that, if a syllable of the language is a prepositive, then it will have CVC structure. Notice that to get a sample of prepositives we have to select them from a text consisting of all kinds of syllables. The total number of syllables that we go through before we get r prepositives, say, q, will, of course, be very much larger than r: q > r. There is yet another kind of probability that we shall find useful, namely joint probability, or the chance that a syllable will have two specified properties. To continue with the present example, we have q syllables of all kinds, r of these are prepositives, and of those r, shave CVC structure. The joint probability that a syllable selected from this sample will be prepositive and have  $\mathring{\text{CVC}}$  structure is s/q. Notice that the joint probability is equal to the product of the simple probability and the corresponding conditional probability:  $s/q = r/q \times s/r$ . Prose descriptions of calculations involving the three kinds of probability rapidly become awkward; so let us introduce some abbreviatory notation. Since the probabilities we are dealing with are the frequencies of the various kinds of syllables, we shall use f to denote probability (or frequency). When we are dealing with probabilities in a metrical context, a subscript 7 or 8 will be used to distinguish the probabilities in positions 7 and 8 respectively. Thus  $f_8(\tilde{\text{CVC}})$  denotes the simple probability of any kind of  $\tilde{\text{CVC}}$ syllable in position 8. To denote a conditional probability we shall use a subscript abbreviation of the conditioning property. Thus  $f_{pre}(\tilde{\text{CVC}})$  is the conditional probability that, if a syllable is a prepositive, it has CVC structure. As mentioned in the preceding paragraph, this conditional probability is 20\%, so we can write  $f_{pre}(C\check{V}C) = 20\%$ . It should be noted that both metrical position and the conditioning property of a conditional probability are denoted by subscripts: this reflects the fact that all the probabilities calculated for a metrical position are logically conditional probabilities. Joint probability is denoted by writing the abbreviations for the two relevant properties on the line in parentheses: e.g.,  $f_8$ (mono,  $C\tilde{V}C$ ) denotes the probability of finding in position 8 a monosyllable that has CVC structure.

Let us proceed to calculate the quantitative effect of Wernicke's Law and the spondee zeugma and the frequency of  $C\check{V}C$  in prepositives on the distribution of monosyllable types in position 8. As we saw above, for two properties x and y, the joint probability of

both x and y, f(x, y), is equal to the product of the simple probability of x, f(x), and the conditional probability from x to y,  $f_x(y)$ . Therefore  $f(x, y) = f(x)f_x(y)$ . Dividing both sides of this equation by f(x), we see that the conditional probability from x to y is equal to the joint probability of x and y divided by the simple probability of x:  $f_x(y) = f(x, y)/f(x)$ . Now the frequency of monosyllables (of all kinds) in any position (metrical or not) is simply the sum of the frequencies of prepositives, f(pre), and nonprepositives, f(pre), in that position: f(mono) = f(pre) + f(pre). Similarly, for the conditional probability, "if monosyllable, then CVC":  $f_{mono}(CVC) = f_{pre}(CVC) + f_{pre}(CVC)$ . And for the joint probability of both monosyllable and CVC in monosyllables in position 8 equals the joint probability of both monosyllable and CVC in position 8 divided by the simple probability of a monosyllable in position 8, we have:

$$f_{8\text{mono}}(\text{C}\check{\text{V}}\text{C}) = \frac{f_8(\text{mono}, \text{C}\check{\text{V}}\text{C})}{f_8(\text{mono})}$$
.

Substituting the sums above in the right-hand side of this equation, we get:

$$f_{\rm 8mono}(\text{C\c VC}) = \frac{f_8(\text{pre})f_{\rm 8pre}(\text{C\c VC}) + f_8(\sim \text{pre})f_{\rm 8\sim pre}(\text{C\c VC})}{f_8(\text{pre}) + f_8(\sim \text{pre})}.$$

We can now see precisely how Wernicke's Law and the spondee zeugma affect the frequency of  $\CVC$  in monosyllables in position 8. The spondee zeugma insures that  $f_8(\sim pre)$  is very small, but most importantly Wernicke's Law guarantees that  $f_{8\sim pre}(\CVC) = 0$ , i.e., it removes all  $\CVC$ 's from the nonprepositives. Since Wernicke's Law does not affect prepositives, we can equate the frequency of  $\CVC$  in prepositives for nonmetrical language with the frequency in metrical contexts:  $f_{pre}(\CVC) = f_{8pre}(\CVC) = 20\%$ . This is the mathematical form of the assumption that no factors other than Wernicke's Law and the spondee zeugma affect the frequency of  $\CVC$  in monosyllables. Thus we can simply ignore the second term of the numerator in the above equation (since it is zero) and substitute 20% for  $f_{8pre}(\CVC)$ :

$$f_{\text{8mono}}(\text{CVC}) : = \frac{f_8(\text{pre}) \times 20\%}{f_8(\text{pre}) + f_8(\sim \text{pre})}.$$

Since the frequency of CČC in nonprepositives is much greater than in prepositives, we may view Wernicke's Law as cutting off the richest source of CČC monosyllables. Since  $f_8(\sim pre)$  is very small (because of the spondee zeugma), we shall be able to estimate quite adequately the frequency of CČC in monosyllables in position 8 [ $f_{8mono}(CČC)$ ] by the frequency of CČC in prepositives [ $f_{pre}(CČC)$ ], i.e., we can use  $f_{8mono}(CČC) = 20\%$ .

Test of null hypothesis. We can now give an explicit mathematical formulation of the hypothesis that Wernicke's Law and the spondee zeugma are the only causes of the I-S difference. If they are not, we shall be able to ascertain the extent of their contribution.

36. This procedure is neither appreciably inaccurate in fact (since exceptions are rare) nor circular in theory. We approximate  $f_{8\text{mono}}(\text{C}\check{\text{V}}\text{C})$  by  $f_{\text{pre}}(\text{C}\check{\text{V}}\text{C})=20\%$ . It is obvious that this approximation must be greater than the exact expected frequency

$$f_{\text{pre}}(\text{C}\breve{\text{V}}\text{C}) > \frac{f_8(\text{pre})f_{\text{pre}}(\text{C}\breve{\text{V}}\text{C})}{f_8(\text{pre}) + f_8(\sim \text{pre})}$$

when  $f_8(\sim)$  is greater than zero, i.e., when there are exceptions to the spondee zeugma. This minor inaccuracy actually works against the null hypothesis: we are in effect counting the small additional reduction in monosyllabic CVC frequency caused by exception to the spondee zeugma against the null hypothesis rather than in favor of it, as we would be entitled to do.

We already have the formula for monosyllables in position 8. All we have to do is extend Wernicke's Law to polysyllabic words. Since Wernicke's Law does not affect nonjunctural syllables, we do not have to make any adjustments in the conditional probability of CVC in nonjunctural syllables of polysyllabic words. According to the present null hypothesis, then, the frequency of CVC in nonjunctural syllables of polysyllabic words must be the same in position 8 as in position 7. Denoting nonjunctural syllables of polysyllabic words by S-, the present null hypothesis requires  $f_{7S}(C\check{V}C) = f_{8S}(C\check{V}C)$ . Indeed, if this were not so, it would mean that some other factor in addition to Wernicke's Law had been introduced (though not necessarily a durational factor). On the other hand, Wernicke's Law will eliminate all CVC's from junctural syllables of polysyllabic words in position 8. We can therefore simply ignore the few junctural syllables that may occur in position 8 when we calculate the frequency of CVC. The spondee zeugma, however, will have a more complex effect. Since it so greatly reduces the frequency of junctural syllables in position 8, the frequency of nonjunctural syllables will have to increase, and even be greater than it is in position 7:  $f_8(S_-) > f_7(S_-)$ . This means that the value of  $f_8(S_-)$  in the test below will be estimated directly from a large sample of the biceps, since there is no a priori way to derive this value from  $f_7(S_7)$ . By the above rule for joint probabilities, the frequency of nonjunctural syllables of polysyllabic words with CVC structure required by the present null hypothesis equals the frequency of nonjunctural syllables of polysyllabic words in position 8 multiplied by the frequency of CVC in nonjunctural syllables of polysyllabic words (as observed in position 7):  $f_8(S-, CVC) = f_8(S-)f_{75-}(CVC)$ . [Note that ex hypothesi  $f_{7S-}(C\breve{V}C) = f_{8S-}(C\breve{V}C)$ .] Similarly the frequency of prepositives having  $C\breve{V}C$  structure in position 8 will be the product of the frequency of prepositives in position 8 and the frequency of CVC in prepositives:  $f_8(\text{pre}, \text{CVC}) = f_8(\text{pre})f_{\text{pre}}(\text{CVC})$ . Now since prepositives and nonjunctural syllables of polysyllabic words are the only sources of CVC syllables in position 8, the overall frequency of CVC in 8 will be (according to the null hypothesis) the sum of these two frequencies:

$$f_8'(C\breve{V}C) = f_8(pre)f_{pre}(C\breve{V}C) + f_8(S-)f_{7S-}(C\breve{V}C)$$
.

If the present null hypothesis is correct, the difference between the frequency of  $C\check{V}C$  actually observed in positions 7 and 8 must be equal to the difference between the actually observed value in position 7 and the value calculated for position 8 by the above formula. Denoting the actually observed difference as  $\Delta$ , and the hypothetically projected difference as  $\Delta'$ , we have in formulas:

$$\Delta = f_7(\text{C\breve{V}C}) - f_8(\text{C\breve{V}C})$$
  
$$\Delta' = f_7(\text{C\breve{V}C}) - [f_8(\text{pre})f_{\text{pre}}(\text{C\breve{V}C}) + f_8(\text{S-})f_{7\text{S-}}(\text{C\breve{V}C})].$$

If the values of  $\Delta$  and  $\Delta'$  are not significantly different, then it will be clear that Wernicke's Law and the spondee zeugma alone produce the I-S difference, and there will be no basis for positing any additional factors. If  $\Delta'$  is smaller than  $\Delta$ , then there must be some other factor involved as well.

In order to put this test into practice, we must obtain a large sample of spondaic fourth feet from Homer, and determine the following data from that sample: (a) the overall frequencies of CVC in positions 7 and 8  $[f_7(CVC)]$  and  $f_8(CVC)]$ ; (b) in position 7 the frequency of CVC in nonjunctural syllables of polysyllabic words  $[f_{78}(CVC)]$ ; and (c) in position 8 the frequency of prepositives  $[f_8(pre)]$  and the frequency of nonjunctural syllables of polysyllabic words  $[f_8(S-)]$ . Using those values we then calculate  $\Delta$  and  $\Delta'$ . We have carried out all of this sampling for the first thousand lines of the *Iliad* and the first thousand lines of the *Odyssey*. We obtained an actual difference  $\Delta = 20.91\%$ . The value projected on the present null hypothesis for this sample was  $\Delta' = 6.44\%$ . Since the actually observed

difference is more than three times as great as the hypothetically projected difference, it is clear that Wernicke's Law and the spondee zeugma cannot be the only factors producing the I-S difference. A closer examination of the data will reveal where the additional factors must lie.

We know from the spondee zeugma that nonjunctural syllables must be more frequent in position 8 than in 7:  $f_8(S_-) > f_7(S_-)$ . In fact the frequency is 83.46% in position 8 (monosyllables 17.47% plus nonjunctural syllables of polysyllabic words 65.99%) as against 53.51% in position 7. We could obtain the observed difference  $f_7(CVC) - f_8(CVC) = 20.91\%$  from the above formula for  $\Delta'$  only if the frequency of either monosyllables or junctural syllables, or both, was greater than the frequency actually observed in position 8. For example, if we hold the frequency of monosyllables as observed, and solve the system of equations

and 
$$20.91\% = f_7(\text{C\breve{V}C}) - [f_8(\text{pre})f_{\text{pre}}(\text{C\breve{V}C}) + f_8(\text{S-})f_{7\text{S-}}(\text{C\breve{V}C})]$$
$$100\% = f_8(\text{pre}) + f_8(\text{S-}) + f_8(\text{S\#})$$

for the frequency of junctural syllables  $[f_8(S\#)]$  that would give the observed difference of 20.91%, we obtain  $f_8(S\#) = 45.78\%$  (i.e., junctural syllables in position 8 would have to increase in frequency to a degree inconsistent with the spondee zeugma). Or, keeping the junctural syllables as observed, if we solve for the frequency of prepositives, we obtain  $f_8(\text{pre}) = 66.55\%$  (a degree of increase inconsistent with the resources of the language). As the facts stand, the frequency of nonjunctural syllables of polysyllabic words is greater in position 8 than in position  $7:f_8(S-) = 65.99\%$  and  $f_7(S-) = 46.02\%$ ; yet the frequency of CVC in nonjunctural syllables of polysyllabic words is less in position 8 than in position 7:  $f_8(CVC-) = 17.94\%$  and  $f_7(CVC-) = 22.78\%$ . As a result it is necessarily the case that nonjunctural syllables of polysyllabic words must have a lower frequency of CVC in position 8 than they do in position 7. This means that the crucial assumption of the present hypothesis that  $f_{78-}(CVC) = f_{88-}(CVC)$  is clearly false. In fact the observed figures are  $f_{88-}(CVC) = 27.19\%$  and  $f_{78-}(CVC) = 49.49\%$ .

We must now determine whether this difference is metrically significant in Irigoin's sense, i.e., whether it indicates a durationally motivated choice of more CČC's in position 7 than in position 8. For, as we shall see in the next section, simply having proved the existence of this difference in CČC frequency of nonjunctural syllables between the two positions does not determine whether or not it is an automatic reflex of other factors which are not durationally motivated.

#### 8. SOME FALSE ASSUMPTIONS

Although Irigoin is never very explicit on the matter, one suspects that underlying his claim that the I-S differences possess metrical significance is the assumption that, if Homer were writing according to the traditional conception of the hexameter (without the structural modifications Irigoin suggests), there would be no I-S difference at all between longum and biceps. But this assumption in turn presupposes one of two other assumptions: either (1) that the distribution of CVC, CV, etc., is the same for all heavy syllables in all word shapes; or (2) that the distribution of word shapes in the hexameter is random. Since both of these assumptions are not merely theoretically questionable, but actually false, it is clear that proof of the

metrical significance of the I-S differences depends on the demonstration that they are not an automatic reflex of the linguistic and metrical distribution factors just mentioned, although, as will become apparent in the next section, the full range of possibilities is not exhausted by the outline just given. The plain fact is that the mere existence of I-S differences does not guarantee their metrical significance. Any quantitative relation between longum and biceps could be the automatic outcome of the interaction of independent quantitative properties of language and meter, and thus not the result of deliberate manipulation by the poet to satisfy additional (durational) requirements. Therefore the very absence of any such difference (no I-S difference) could be of great significance for metrical structure. The absence of an I-S difference might well not be a simple reflex phenomenon (as the data given in § 10 will show). Indeed, the absence of an I-S difference would be strong indication that the contracted biceps was shorter than the longum, and definitely not that biceps and longum were equivalent (as Irigoin would apparently have assumed in that case).

#### 9. LOGICAL PREREQUISITES FOR METRICAL SIGNIFICANCE OF DATA

The assumption that the I-S differences are metrically significant presupposes that, if the durational motivation for those differences were absent, as the linguistic structure of Homeric Greek interacted with the well-known rules of the hexameter, the various types of heavy syllable would have had equal chances of appearing in both longum and biceps, and that therefore no difference in the frequencies would be expected; or it presupposes either that the biceps would be biased in favor of the "shorter" types, or the longum in favor of the "longer" types, or both, so that the expected difference would be the reverse of the observed difference. There are two factors involved in the above assumptions concerning the interaction of language and meter. The first is a metrical one, provenance, the frequencies with which the syllables of the *longum* and the *biceps* respectively come from various positions in different word shapes: for example, the percentage of the longa that are implemented by, say, the second syllable of words of the shape ~ - - -, and so forth, in position 7; and the percentage of the bicipitia that are implemented by the third syllable of words of the shape - - - -, and so forth, in position 8. (In other words, we must know the frequency of # $\sim \frac{7}{4}$  - -# and the frequency of #~ - \* - ~#, etc., in the hexameter.) The second factor is a linguistic one, positional frequency, the frequencies of the syllable types (CVC, CV, CVC) in those positions of those word shapes: for example, the frequency of CVC in the second syllable of words of the shape - - - -, and so on. The fundamental question is, Are the factors of provenance and positional frequency constant for all metrical locations and all positions in all word shapes or do they show variation? In other words, does a given provenance have the same frequency in both longum and biceps (e.g., is - as frequent as \* -, etc.) and does, say, CVC have the same frequency in every position of every word shape (e.g., in the language is ~ CVC - - as frequent as ~ - CVC -, and so on)? There are four combinations of constancy (+) and variation (-) of these two factors and three sorts of relation between biceps and longum that would result (in the absence of durational requirements): (a) no difference would result between the biceps and the longum (denoted by 0); (b) the resultant difference is in the same direction as the observed I-S difference (denoted >); (c) the resultant difference is in the reverse direction (denoted <). The possible combinations of constancy and variation and the resultant difference between biceps and longum for each combination are given in Table 4.

It will be seen that cases 1, 2, 3, 4(a), and 4(c) all satisfy Irigoin's underlying assumption that the I-S differences are due to a metrical rule of the structure of the hexameter which distinguishes the linguistic implementations of the longum and biceps elements. The first three cases are automatically determined as to the resultant difference: the presence of a plus value in either of the first two columns insures that no difference between the biceps and longum would arise in the absence of deliberate manipulation by the poet. The fourth, however, is not predictable in the absence of concrete data: any of the three relations of biceps to longum is logically possible. We know, however, as the statistics of O'Neill<sup>37</sup> show, that there are severe restrictions on the occurrence of word shapes vis-à-vis the metrical positions permitted them by the mere dactyl/spondee sequences of the hexameter. These restrictions are the result of a small set of rules, which are, of course, not motivated by a desire to produce I-S differences, but are totally independent factors.38 The result of word-shape localization is that the syllables which implement the longum generally come from different word shapes than do syllables which implement the contracted biceps. It follows that any of the cases in Table 4 which show a plus in the first column must be false. Furthermore, there is absolutely no justification for assuming a priori that in the language the various syllable types must have the same frequencies in all positions in all words. Indeed, considerations of inflectional and derivational morphology would lead us to expect the opposite. We are left with the task

TABLE 4

	Provenance	Positional frequency	Difference between biceps and longum
Case 1	+	+	0
Case 2	+	_	0
Case 3	_	+	0
Case 4	_	-	(a) 0 (b) > (c) <

<sup>37.</sup> O'Neill, "Localization of Metrical Word Types."

<sup>38.</sup> See now R. Beekes, "On the Structure of the Greek Hexameter," Glotta 50 (1972): 1-10.

of deciding among the three logical possibilities under case 4, namely (a), (b), or (c); we obviously cannot simply assume the validity of (a) or (c), as Irigoin apparently does.

#### 10. TEST OF NULL HYPOTHESIS: ESTIMATION OF I-S DIFFERENCE FROM PROSE

We now have a much more sophisticated null hypothesis, namely that the I-S differences arise automatically from the combination of factors: provenance and positional frequency as well as Wernicke's Law and the spondee zeugma (i.e., case 4[b] in § 9). To decide among the three alternatives of case 4, we must find a way to calculate the respective differences between the longum and the biceps for the frequencies of  $\overrightarrow{CVC}$ ,  $\overrightarrow{CV}$ , and  $\overrightarrow{CVC}$ that would be expected in the absence of any durational motivation. We have already isolated the metrical and linguistic factors involved. Since the former (the provenance frequencies including those affected by the spondee zeugma) can easily be calculated from data already provided by O'Neill, all we have to do is estimate the latter (positional frequencies of the syllable types) on the basis of samples from nonmetrical texts. It would be fallacious to use any metrical text. The data derived from a metrical context would contain a petitio principii, since one of the things we must ascertain is whether the positional frequencies in metrical contexts differ from those in prose.

Let us examine the procedure in greater detail. First of all the metrical factors: the modification for Wernicke's Law is the same as in § 7, i.e., the frequency of CVC for junctural syllables in position 8 is zero  $[f_{88\#}(CVC)]$  = 0]. The new element that we have introduced is provenance, the frequency with which the *longum* or the *biceps* respectively is filled by a given syllabic position in a given word shape. For example, let us take the shape - - - -. What we have to do is convert the data given by O'Neill into percentages, so that we have the relative frequency of the longa that are implemented by the second syllable of this shape and the relative frequency of bicipitia implemented by the third syllable of this shape (i.e., the number of occurrences of  $\sim \frac{7}{2}$  so in our sample, divided by the number of longa and divided by the number of contracted bicipitia, respectively). In the same way we obtain the provenance frequencies for each relevant syllabic position in each word shape for longum and biceps. The linguistic factor, positional frequency of syllable types, is only slightly more complex, but involves very extensive sampling from prose. To take the word shape  $\sim$  - - as an example again, we obtain a large sample of words of this shape from prose, and from that sample calculate, for example, the frequency of CVC in the second syllabic position and in the third (since these are the only two relevant positions in that shape). We then multiply the provenance frequency of the second syllabic position in the shape - - - by the positional frequency of CVC in that second position. This product is the contribution of that one provenance,  $\sim \frac{1}{2}$  - -, to the overall frequency of CVC in the longum (and similarly for the biceps). Adding up all the products for each provenance and positional frequency, we calculate the overall frequency of CVC in the

longum and biceps, respectively, that would arise in the absence of any durational factor. These frequencies are calculated in a purely mathematical way, without adopting the dubious procedure of writing hexameters by fitting together words taken at random from prose. We are using the quantitative properties of Homer's hexameter (as determined by O'Neill) and the quantitative properties of Greek linguistic structure (as determined by us from large samples of Thucydides) to make a mathematical model of the spondaic fourth foot of a hexameter in which any durational differences between heavy syllable types would be ignored. In this way we let Homer arrange the words to fit the meter, but let Thucydides (our prose sample) provide the types of heavy syllables in those words.

Let us introduce some abbreviatory notation at this point and proceed somewhat more rigorously. We can label each provenance with an arbitrary number: 1, 2, 3,  $\dots$  Let i stand for any one of these provenances. Similarly let j stand for one of the syllable types, CVC, CV, CVC. Now  $f_7(i)$  means the frequency with which position 7 is filled by a syllable of provenance i, e.g., the second syllable of the shape  $\sim --$ .  $f'_i(j)$  means the frequency of syllable type j when its provenance is i, e.g., the frequency of CVC in the second syllable of  $\sim$  - -. We use the prime sign ' to indicate that these (positional) values are prose values as demanded by our null hypothesis, and values not directly observed in Homer. If duration really were a factor, the values of the syllable-type frequencies of each provenance obtained from metrical contexts would be different from the values obtained from the prose sample, e.g.,  $f_{7i}(C\check{V}C) > f'_{i}(C\check{V}C) > f_{8i}(C\check{V}C)$ . Now each provenance frequency [e.g.,  $f_7(i)$ ] and each corresponding positional frequency  $[f'_i(j)]$ are simple and conditional probabilities respectively, so that their product is a joint probability [e.g.,  $f_7(i, j)$ ]. For example, from Table 7 below we find that CVC syllables from the second syllabic position of words with the shape  $\sim$  - - constitute 7.82% of all the syllables in position 7 (according to the null hypothesis). For the sake of this example, letting i denote  $\sim$   $\stackrel{*}{-}$  - and j denote CVC, we have  $f_7(i, j) = 7.82\%$  (and so on, for all the provenances and syllable types i and j can refer to, respectively, for longum and biceps). Now if we add up each of these joint probabilities  $[f_7(i,j)]$  for each provenance (i = 1, 2, 3, ...) in the longum, we obtain the simple probability of syllable type j in the longum:

$$f_7'(j) = f_7'(1,j) + f_7'(2,j) + f_7'(3,j) + \dots$$

Such a sum of items labeled by i is indicated by  $\sum_{i}$ . Thus the frequency of syllable type j in the *longum*, expressed as the sum of the products of the provenance and positional frequencies, is

$$f'_{1}(j) = \sum_{i} f_{7}(i) f'_{i}(j)$$

and similarly for the biceps. The values calculated by these formulas will be the syllable-type frequencies that would occur in the longum and biceps in

the absence of any durational factor in choosing between the syllable types. In other words, we are calculating the frequencies that  $C\check{V}C$ , etc., would have in the *longum* and the *biceps* if each type of heavy syllable were free to occur at the prose frequency normal for it in a given syllabic position in a given word shape, i.e., if the structure of heavy syllables were (except for Wernicke's Law) irrelevant for the meter. Of course, when we take the sum over all the syllable types j as well, we have 100% of all the syllables in position 7:

$$\sum_{i} \sum_{j} f_{7}(i) f'_{i}(j) = 100\%.$$

For the contracted *biceps* we must remember the earlier remarks on Wernicke's Law, that the positional frequency of  $C\check{V}C$  is zero when the provenance is junctural in position  $8: f_{88\#}(C\check{V}C) = 0$ , and that for monosyllables the frequency is nearly that of prepositives:  $f_{8mono}(C\check{V}C) = f_{pre}(C\check{V}C)$ . It should be noted that in all other cases the prose-language values of the  $f'_i(j)$  will appear in the formulas for both positions 7 and 8 (this in contrast to the procedure in § 7).

If we can project, on the basis of our prose frequency values, that  $f_7'(C\check{V}C) > f_8'(C\check{V}C)$  and  $f_8'(C\bar{V}[C]) > f_7'(C\bar{V}[C])^{39}$  as well as that  $f_7'(C\check{V}C) > f_8'(C\check{V}C),^{40}$  i.e., that the frequency of  $C\check{V}C$  in nonjunctural syllables in 7 is greater than in 8, then we will have demonstrated that 4(b) of Table 4 is the case and that the I-S differences are merely reflex phenomena. Any other result would be in favor of Irigoin's hypothesis.

Obviously there is no Homeric prose available for sampling; an investigation is thus at the mercy of the many possible differences of dialect, style, subject matter, etc., between Homeric language and any later Greek prose text. We are, therefore, reduced to assessing the extent to which accessible data substantiate Irigoin's hypothesis and the null hypothesis, respectively. Against Irigoin's hypothesis is the fact that it involves a complex and unnatural metrical structure. If it can further be demonstrated that, in the linguistic material of another Greek text or texts, the I-S differences would be automatic in the hexameter, that would be all the more reason not to abandon the traditionally accepted null hypothesis, unless the Homeric dialect should differ from that sample text in such a way that no I-S difference or a difference in the opposite direction (cases 4[a] and 4[c] in Table 4) would be automatic. However, it is quite improbable and empirically unprovable that the Homeric dialect would yield case 4(a) or 4(c), whereas a sample text would yield an automatic I-S difference (case 4[b]).

Having no Homeric prose, we chose Thucydides at random as the source

<sup>39.</sup>  $f_7'(C\bar{V}[C])$  is the projected relative frequency of either  $C\bar{V}$  or  $C\bar{V}C$  syllables in position 7, i.e., the sum  $f_7'(C\bar{V}) + f_7'(C\bar{V}C)$ ; this in turn is 100% minus the relative frequency of  $C\bar{V}C$  in position 7:  $f_7'(C\bar{V}[C]) = 100\% - f_7'(C\bar{V}C)$ .

<sup>40.</sup> This further stipulation is necessary in view of our remarks here and in § 7 and § 9. It requires that the normal prose positional frequencies of CVC which are not affected by Wernicke's Law be greater for the provenances permitted in position 7 than for those permitted in position 8, even though the frequency of the nonjunctural provenances in 7 is smaller than in 8.

of our samples of each relevant word shape. It is on the basis of these samples that we have estimated the values of the relevant positional frequencies [the values of  $f_i'(j)$  in the above formulas]. Since it is practically impossible to assess all the factors of style, subject matter, dialect, etc., there are no sure and complete criteria available on which to prefer one text over another (except, of course, length). In view of this, we do not consider it worthwhile to attempt to assess the proximity of possible sample texts to the linguistic material available to Homer with respect to all of the variables. Our aim is merely to discover whether Irigoin's presuppositions would hold for the language of a randomly chosen Greek text.

As in § 7, we need carry out our calculations only for the frequencies of CVC in spondees. In accordance with the distinctions imposed by Wernicke's Law, we shall present the data separately for the three major provenance classes: monosyllables, junctural syllables of polysyllabic words, and non-junctural syllables of polysyllabic words. The observed values are those that occur in the first thousand lines of the *Iliad* and the first thousand lines of the *Odyssey* (i.e., the same sample as chosen by O'Neill).<sup>41</sup> The values projected on the null hypothesis are calculated on the basis of provenance frequencies obtained from O'Neill's data and positional frequencies obtained from our samples of each relevant word shape taken from Thucydides, according to the methods described above.

The frequency of monosyllabic CVC is given in Table 5.

TABLE 5

	Position 7	Position 8
Observed $f(\text{mono, C\BWC})$ Projected $f'(\text{mono, C\BWC})$	3.28% 2.54%	3.59% 3.49%

The projected value for position 7 is based on the average for all monosyllables estimated from a sample of 500 monosyllables (excluding the article) taken from Thucydides. For position 8, see the remarks in § 7.

The frequency of junctural syllables of polysyllabic words is given in Table 6.

TABLE 6

	Position 7	Position 8
Observed f(CVC#) Projected f'(CVC#)	16.54% 14.69%	0.16% 0.00%

The projection for position 7 is based on the average for all final syllables of polysyllabic words as estimated from a sample of 500 such finals from

41. Except that we have not excluded repeated lines.

Thucydides. An impartial composition strategy was assumed for positional lengthening, according to which, for such unmetrical sequences as  $-C\breve{V}C\#V$ , the word ending in  $-C\breve{V}C\#$  would be modified in the sense that a word ending in  $C\breve{V}C$  or  $C\breve{V}CC$ , etc., would be used instead (so that a metrical sequence such as  $-C\breve{V}C\#V$ - would result) in 50% of the instances, and the word to the right of the word boundary would be modified (giving, e.g.,  $-C\breve{V}C\#CV$ -) in 50% of the instances. The prose frequencies were then adjusted in accordance with this strategy. This procedure was adopted to avoid the possible circularity involved in sampling from a metrical text. This procedure is in no way biased in favor of our hypothesis: if anything, it works somewhat against it.

The projected frequency of nonjunctural syllables of polysyllabic words is given in Table 7. The columns labeled  $f'_7(i, C\check{V}C^-)$  and  $f'_8(i, C\check{V}C^-)$  give the projected frequency of nonjunctural  $C\check{V}C$  syllables for each of the labeled provenances in the columns to their left. [As explained above, this frequency is the product of the corresponding provenance and positional frequencies:  $f'_7(i, C\check{V}C) = f_7(i)f'_i(C\check{V}C)$ , etc.] The sum of the values in each column is the overall frequency of nonjunctural  $C\check{V}C$  in positions 7 and 8 respectively.

The projected positional frequencies for CVC in each word shape  $[f_i'(\text{CVC-})]$  are estimated from samples ranging from 200 to 500 instances of that word shape taken from Thucydides. The relevant word shapes which are individually of very low frequency in O'Neill's data<sup>42</sup> are correspondingly rare in prose. Obtaining samples for each rare shape would have been prohibitively laborious (and in certain cases the entire text of Thucydides might not have been adequate). Consequently, the frequency of CVC in the rare shapes was estimated by the mean for the other shapes. Notice that in

 $f_8'(i, C\breve{V}C-)$  $f_7'(i, \text{CVC-})$ Provenance of 8 Provenance of 7 1.  $\frac{8}{-}$ 1.  $\frac{7}{-}$ 3.23% 1.87% 8 2.  $\sqrt{\frac{7}{2}}$ 4.60% 3.99% 3.  $\frac{8}{-}$  -  $\sim$ 6.23% 3.  $\sim \frac{7}{4}$ 7.82% \_ 8 \_ \_ 4.  $\sqrt{\frac{7}{2}} - - \sqrt{\frac{1}{2}}$ 2.68% 6.98% 5.  $\frac{8}{}$  -  $\sim$ 2.82% 2.78% 5. rare shapes 2.53% 6. rare shapes 23.80% Total projected 21.73% Total projected 17.94% 22.78% Total observed Total observed

TABLE 7

<sup>42.</sup> Although it does not matter for this particular test, since we are comparing observed and expected values for the same lines that O'Neill used, it should be noted that O'Neill's sample is too small to provide reliable estimates for the individual frequencies of each rare shape. These would have to be combined in other sorts of tests.

fact the null hypothesis does project a lower frequency of nonjunctural CVC in position 8 than in position 7.

The projected and observed overall I-S difference is given in Table 8.

TABLE 8

	Position 7	Position 8	I-S difference
Total $f(C\check{V}C)$ projected	41.03%	25.22%	$\Delta' = 15.81\%$
Total $f(C\check{V}C)$ observed	42.59%	21.58%	$\Delta = 20.91\%$

The results demonstrate that, of the alternatives enumerated in Table 4, the correct one is 4(b), and that the null hypothesis should be retained.

The reader has now seen that a significant I-S difference results naturally and predictably from the interaction of the metrical structure of the hexameter with one type of Greek (Thucydidean Greek). The exact statistical significance of the discrepancy between the projected and observed I-S differences is hardly worth pursuing where so many potentially divergent factors (such as dialect, subject matter, etc.) are involved. This discrepancy results from overestimation of the frequency of CVC in nonjunctural syllables for the word shapes in position 7 and especially in position 8, underestimation for monosyllables in 7, and underestimation for junctural syllables in 7 as well. (In this last case, the reason seems to be that we have chosen the above composition strategy more for its impartiality than for its accuracy.) In fact it came as somewhat of a surprise to us that such a substantial and significant I-S difference could in fact be projected for the Homeric hexameter on the basis of an Attic text.

#### 11. CONCLUSION: "SPONTE SUA CARMEN NUMEROS VENIEBAT AD APTOS"

If any moral can be drawn from the preceding discussion, it is that a fundamental hypothesis about metrical structure, if formulated superficially, i.e., without due regard for the distributional properties of the language and their interaction with the meter, must inevitably constitute a begging of the question. Such disregard of the fundamentum comparationis is all the more dangerous because, while in this case it has led to the insignificant's being interpreted as significant, it could equally well have led to the converse error.

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#### 'LOGAOEDIC' METRE IN GREEK COMEDY

#### By John Williams White

Definitions of logaoedic metre are given by Hephaestion and Aristides Quintilianus. These, unhappily, are not complete. The reason of this, however, is apparent: the metre was relatively unimportant. Both authors add their statements about it to their general treatment of the larger subjects of dactylic and anapaestic metres. But the essential fact is made clear. Hephaestion briefly defines logaoedic metre to be the combination, within the same colon, of two or more dactyls with a trochaic syzygy, or, in ascending rhythm, of two or more anapaests with a catalectic iambic syzygy (bacchius). The most noted form, he adds, in the second category has four anapaests, the first of which may be a spondee or iambus. Logaoedic cola, thus defined, are comparatively rare in Greek comedy.

<sup>&</sup>lt;sup>1</sup> Heph. 25, 12 ff. and 29, 12 ff. (Westphal), and Schol. Heph. 163, 13 ff. Cf. Arist. Quintilianus 33, 30 ff. and 34, 5 ff. (Jahn) = 52 and 53 (M.).

<sup>&</sup>lt;sup>2</sup> For examples of this metre, see Thesm. 1136-1159, p. 20 below. This lyric is altogether singular in the great number of logacedic cola it contains.

Modern writers on Greek metre, G. Hermann (sparingly), Böckh, Rossbach and Westphal, and many others, have extended the application of the term 'logaoedic' to include cola that contain a single 'dactyl' (or single, but isolated, 'dactyls'). This view of logaoedic metre, chiefly through the powerful exposition of Rossbach and Westphal, is now current. It has recently been strongly re-enforced by the acute reasoning of Goodell.¹ But it is not the view of the Greek metricians, who, while they are not always in accord in the application of their theory, agree that the cola which are now under consideration are to be measured differently. According to Heliodorus and Hephaestion, the unit of measurement is here a 'foot' that in its normal form contains four syllables and six times  $(\chi\rho\acute{o}\nuo\iota)$ .

The current 'logaoedic' measurement of the metres in question has twice received fairly complete exposition in its application to Greek comedy, in Rossbach and Westphal's Specielle Griechische Metrik<sup>2</sup> and in J. H. H. Schmidt's Antike Compositionslehre.<sup>8</sup> But, so far as I am aware, the lyrics and stichic periods of comedy that have been classified as 'logaoedic' have never been fully presented in any modern treatise in the forms demanded by ancient metrical theory. I purpose, therefore, in what follows to analyze them in accordance with the doctrine of Hephaestion, with such aid as may be got from the Heliodorean metrical scholia on Aristophanes. Fair opportunity will thus be afforded for comparison.

I exclude from present consideration the lyrics in Aristophanes written, in whole or in part, in the metre made famous by Telesilla. There are six of these lyrics, besides isolated occurrences of the line, in Aristophanes, and the form occurs also in Cratinus and Hermippus; but the Telesilleum, according to Hephaestion, is a mixed Ionic colon, and the discussion of it belongs elsewhere.

<sup>1</sup> Chapters on Greek Metric, pp. 212 ff.

<sup>&</sup>lt;sup>2</sup> Third edit., pp. 653-669.

<sup>&</sup>lt;sup>3</sup> See pp. CLXXXVI-CCCLXXV.

<sup>4</sup> See Heph. 35, 19 ff. (W.).

#### I Choriambic Cola

#### Nubes 510-517

άλλ' ἴθι χαίρων τῆς ἀνδρείας οὖνεκα ταύτης.	} Anapaestic.
εὐτυχία γένοιτο τάν-	1 _00_ 0_0_
θρώπω, ὅτι προήκων	_00_ 0
ές βαθύ της ήλικίας	
515 νεωτέροις την φύσιν αύ-	U_UUU_
τοῦ πράγμασιν χρωτίζεται	5
καὶ σοφίαν ἐπασκεῖ.	_00_ 0

In order to secure greater ease in analysis, the cola are here printed separately, each in its own line, after the manner of the Alexandrines. Catalexis marks the close of a period or hypermetron. The combination of choriambic cola in Aristophanes is generally hypermetrical. Hiatus and syllaba anceps in *acatalectic* cola are extremely rare; they will be noted whenever they thus occur.

The commation that has just been quoted (Nubes 510-517) begins with an anapaestic movement. Compare the beginning of the commation that introduces the parabasis in the Vespae (1009 ff.), where the lyric movement that follows is trochaic.

The remaining cola are all dimeters, rhythmic  $\pi \delta \delta \epsilon s$  of the normal measurement of eight syllables and twelve times, with catalexis in 2, 6, and the commonly allowed irrational element in the odd places of the

iambic dimeter (5). The cola are pure choriambic (3), or mixed choriambic (1, 2, 4, 6), or iambic (5). The designation of 1 and 2 respectively as "first Glyconic" and "first Pherecratean" and of the union of the two as "first Priapean" is modern and highly objectionable.

### Nubes 700-706 = 804-813

804 ἆρ' αἰσθάνει πλεῖστα δι' ή-1 \_\_\_\_\_\_ μας αγάθ' αὐτίχ' έξων μόνας θεων; ως έστιν δδ' έτοιμος απαν-808 τα δρᾶν δς ᾶν κελεύης. U\_U\_ U\_\_ σὺ δ' ἀνδρὸς ἐκπεπληγμένου 5 0\_0000\_0\_-810 καὶ φανερῶς ἐπηρμένου \_00\_ 0\_0\_ γνοὺς ἀπολάψεις ὅ τι πλείστον δύνασαι, \_UU\_ \_UU\_ **\_UU\_** ταχέως · φιλεί γάρ πως τὰ τοι-U\_U\_ \_\_U\_ αθθ' έτέρα τρέπεσθαι. \_\_\_\_\_\_

On the constitution of this lyric, cf. Schol. Ven. 804: χορίαμβος δίμετρος ἀκατάληκτος · χορίαμβος δίμετρος καταληκτικός (Thiemann, δικατάληκτος V) · ἴαμβος πενθημιμερής · ἀπὸ χοριάμβου βάσεως εἰς χορίαμβον · ἴαμβος δίμετρος καταληκτικός · ἴαμβος δίμετρος ἀκατάληκτος · ἀπὸ χοριάμβου βάσεως εἰς ἴαμβον · χοριαμβικὸν τρίμετρον ἀκατάληκτον · χορίαμβος ἐφθημιμερής. The Scholiast divides the text of 3, 4: μόνας θεῶν; ὡς ἔτοιμος δδ' (?) ἐστὶν ἄπαν | τα δρᾶν ος ᾶν κελεύης. He overlooks 8.

The proper disposition of 3, 4 is notoriously difficult.¹ Order, however, may be restored by certain simple transpositions and a single slight change of text:  $\tilde{\epsilon}\sigma\tau\iota\nu$   $\delta\delta$ '  $\tilde{\epsilon}\tau\circ\iota\mu\circ$ s in 807 for the reading of the Mss.,  $\tilde{\epsilon}\tau\circ\iota\mu\circ$ s  $\delta\delta$ '  $\tilde{\epsilon}\sigma\tau\iota\nu$ , and  $\epsilon\iota$ s  $\delta$ '  $\tilde{\epsilon}\pi\circ\rho\circ\nu$   $\tilde{\delta}\tau\circ\nu$   $\tilde{\epsilon}\tau\circ\iota\mu\circ$ s  $\delta$ '  $\tilde{\delta}\tau\circ\nu$   $\epsilon$ 's  $\tilde{\delta}\pi\circ\rho\circ\nu$   $\tilde{\epsilon}\tau\circ\nu$ s. When the order became confused  $\tau\acute{a}\chi\iota\sigma\tau$ ' gave rise to  $\tau a\chi\dot{\nu}$ s  $\delta$ '. With \_\_\_ou\_ (3) as the second syzygy of a lyric iambic trimeter, cf. Ran. 398 ('Iakxe  $\pi\circ\lambda\nu\tau\iota\mu\eta\tau\epsilon$ ,  $\mu\epsilon\lambda\circ$ s  $\epsilon\circ\rho\tau\eta$ s), 399, 403 (o\_ou\_) and in a lyric tetrameter, Plut. 292. See also Eccl. 971 = 975. The occurrence of  $\Sigma$ ou as the first syzygy of a lyric iambic trimeter or dimeter (5) is not rare. Cf. Ach. 1158 =

<sup>&</sup>lt;sup>1</sup> See Luthmer, De Choriambico et Ionico a minore diiambi loco positis (1884), p. 45 f. Von Wilamowitz in his Isyllos von Epidauros (1886), p. 136, classified this lyric as Ionic.

1170, Eccl. 972, Thesm. 353, 999, Vesp. 1466. On the occurrence of \_\_ooo in a *choriambic* colon, where the text is not to be impugned, see the next lyric. The correspondence of choriamb and iambic syzygy (3) is not uncommon. See the second lyric below (Vesp. 526 ff.).

On the apparent initial anapaest in 8, see p. 8. Cola 7-9 are lacking in the ode.

# Nubes 949-958 = 1024-1033

949 νῦν δείξετον τὼ πισύνω

τοῖς περιδεξίοισι

λόγοισι καὶ φροντίσι καὶ

952 γνωμοτύποις μερίμναις,

λέγων ἀμείνων πότερος

φανήσεται. νῦν γὰρ ἄπας

ἐνθάδε κίνδυνος ἀνείται σοφίας,

957 ἢς πέρι τοῖς ἐμοῖς φίλοις

ἐστὶν ἀγὼν μέγιστος.

### Vespae 526-545 = 631-647

Xo.	νῦν δὲ τὸν ἐκ θἠμετέρου	1 _0000_
	γυμνασίου λέγειν τι δεῖ	_oo_ <u>_</u> o
	καινόν, ὅπως φανήσει —	_00_ 0_≌
529 <b>B</b> δ.	ἐνεγκάτω μοι δεῦρο τὴν κίστην τις ὡς τάχιστα.	Iambic tetrameter.
530	ἀτὰρ φανεῖ ποῖός τις ὧν, ἢν ταῦτα παρακελεύη;	Iambic tetrameter.
532 Xo.	μὴ κατὰ τὸν νεανίαν	_∪⊒⊻ ∪_∪_
	τόνδε λέγειν. δρᾶς γὰρ ὧς	5 _0_ 0_0_

	σοι μέγας ἔστ' ἀγὼν νῦν	_00_ 0
535	καὶ περὶ τῶν ἀπάντων	_00_ 0
	εἶπερ, ὃ μὴ γένοιτο,	_00_ 0_0
	οὖτος ἐθέλει κρατῆσαι	_ <b>ຕ</b> ດ−ດ−ក
Вδ.	καὶ μὴν ὄσ' ἃν λέξη γ' ἇπλῶς μνημόσυνα γράψομαι 'γώ.	} Iambic tetrameter.
539 Фι.	τί γὰρ φάθ' ὑμεῖς, ἢν ὁδί	{ Iambic tetrameter.
<b>54</b> 0	με τῷ λόγῳ κρατήση;	) 141-1510 1011411101011
Xo.	οὖκέτι πρεσβυτῶν ὄχλος	10
	χρήσιμος ἔστ' οὐδ' ἀκαρῆ•	_0000_
	σκωπτόμενοι δ' έν ταῖς ὁδοῖς	_000
	θαλλοφόροι καλούμεθ', ἀντ-	_00_ 0_0_
	ωμοσιῶν κελύφη.	_00_ 0_9

Bentley and Porson, demanding exact choriambic correspondence in choriambic cola (\_\_o\_\_ with \_\_o\_\_), proposed many changes of text in this lyric, the former τονδὶ (533) for τόνδε R V, γένοιθ' οὖ | τος γ' ἐθέλων (536 f.) for γένοιτο νῦν οὖτος ἐθέλει R V, and the latter νῦν δὴ (526) for νῦν δὲ R V, δεῖ τι λέγειν (527) for λέγειν τι δεῖ R V, σ' ἐθέλει (537), ὡς δ' ἐπὶ πάντ' ἐλήλυθεν (636) for ὡς δὲ πάντ' ἐπελήλυθεν R V. In the last case Porson doubted the equivalence of choriambic dimeter and Glyconic. I know no exact parallel to this in comedy (Hermann proposed one in Thesm. 990 = 995 — see p. 20 below), but this correspondence is not so difficult as that in Eq. 332 = 406, where the parody fixes the form and forbids emendation. In 534 Bentley added νῦν, transferring it from 536. Porson corrected (542 f.) δ' ἀν ἐν ταῖσιν ὁδοῖσιν (ὁδοῖς R) ἀπάσαις . . . καλοίμεθ' R V to the reading given above. The last syzygy of colon 13 of the antode is lacking in the Mss.

Besides the four cases of correspondence of choriambus with iambic syzygy that are found in the lyric under consideration, the following also occur in cola that have not been emended: \_\_\_\_\_ Lys. 324 = 338, \_\_\_\_\_ Lys. 326 = 340, \_\_\_\_\_ Ach. 1151 = 1163. Thus \_\_\_\_\_ occurs four times, \_\_\_\_\_ twice, and \_\_\_\_\_\_ once.

I add, in order to afford means of comparison, the correspondences in lyric iambic syzygies, the text of which has not been emended, that occur among the lyrics discussed in this paper: 5\_0\_ Nub. 951 = 1026,

Lys. 321 = 335, etc., etc., o\_ooo Nub. 705 = 809,  $\overline{o}_{-}o^{o}_{-}$  Nub. 954 = 1028,  $\underline{v}_{-}o^{o}_{-}$  Eccl. 969 = 972,  $\overline{o}_{-}o^{o}_{-}$  Ach. 1157 = 1169, Vesp. 1455 = 1467, Lys. 325 = 339 and 328 = 342, ooo\_o Ach. 1158 = 1170,  $\overline{o}_{-}o^{o}_{-}$  Ach. 1156 = 1168,  $\underline{v}_{-}o^{o}_{-}$  Vesp. 1454 = 1466,  $\overline{o}_{-}o^{o}_{-}$  (?) Lys. 324 = 338,  $\underline{v}_{-}o^{o}_{-}$  (?) Eccl. 911 ( $o^{o}_{-}\chi$   $\eta^{o}_{-}\kappa\epsilon_{0}$   $\mu o^{o}_{-}\tau a\hat{\iota}\rho os$ ) = 919 (bis).

#### Lysistrata 321-334 = 335-349

335 ήκουσα γὰρ τυφογέρον-1 0\_0\_ τας ἄνδρας ἔρρειν, στελέχη U\_U\_ \_UU\_ φέροντας ώσπερ βαλανεύσοντας U\_U\_ \_UU\_ .\_¥ ές πόλιν ώς τριτάλαντον βάρος, 0000VV\_00\_ δεινότατ' ἀπειλοῦντας ἐπῶν 5 0000\_ \_00\_ 340 ώς πυρί χρη τὰς μυσαρὰς \_00\_ \_00\_ γυναίκας ανθρακεύειν ピロリー 341 ắs  $\vec{\omega}$   $\theta \epsilon \hat{\alpha}$   $\mu \dot{\eta}$   $\pi o \tau$   $\dot{\epsilon} \gamma \hat{\omega}$ \_\_\_\_\_\_ πιμπραμένας ίδοιμι, \_\_\_\_\_\_ 342 άλλὰ πολέμου καὶ μανιῶν 10 JUUUL \_UU\_ ρυσαμένας Έλλάδα καὶ πολίτας, έφ' οἶσπερ ὧ χρυσολόφα 345 πολιούχε σὰς ἔσχον ἔδρας. καί σε καλῶ ξύμμαχον ὦ Τριτογένει, εί τις ἐκείνας ὑποπίμπρησιν ἀνήρ, φέρειν ύδωρ μεθ' ήμων.

The colon corresponding to 345 is lacking in the ode.

Three forms are found in the first half of a choriambic dimeter in this lyric that have not previously occurred: (1) 0000 - (4, 5, 10). Cf. Vesp. 1453 = 1465, 1455, 1456 = 1468, and the discussion of Aves 1372 ff. (p. 11 f.), a comic parody. The same form occurs as the first syzygy of an iambic dimeter in Ach. 1156, 1157. (2) 0000 - (5, 10). Cf. Vesp. 1467. Also in an iambic dimeter in Ach. 1169. (3) 0000 - (13). This anapaest is generally excluded by the commentators, beginning with Bentley, who proposed 0000 - (13) in itself a felicitous change of text. Another apparent instance of the anapaest in choriambic verse occurs in Eccles. 0400 = 944, but this cannot be cited as evidence of the usage of Aristophanes, since in Eccles. 038 ff.

the poet is imitating the common form of the scolium, in which the metrical constitution of the last two verses is uncertain. To pass to iambies,  $\tau \alpha \chi \acute{\epsilon} \omega s$  in Nub. 812 is no doubt a dissyllable, and in Thesm. 355 the metre may be Ionic:  $00_{-}0_{-}$  (anaclasis). The anapaest does not occur, so far as I have observed, in any of the pure iambic lyrics of Aristophanes. On the other hand, it is found in two polyschematist dimeters in both R and V, Vesp. 1461 = 1473. See p. 23. In Vesp. 1458, Küster's change of  $\phi \acute{\nu} \sigma \epsilon \omega s$  (R, V) to  $\phi \acute{\nu} \sigma \epsilon \omega s$  is probably right. Here the antode (1470) shows 000. The natural inference from these facts is that the anapaest is faulty in all these places, especially when one recalls to mind the assault that Aristophanes, in Ran. 1322 ff., makes upon its use by Euripides in Glyconics. See p. 29 ff.

To avoid the correspondence 250 in 7, Meineke proposed τάς κύνας for γυναϊκας (Mss.).

On the form of the catalexis of the trimeter in 3 compare the tetrameter in Av. 1724 f.

#### Ecclesiazusae 968-971 = 972-975

καὶ ταῦτα μέντοι μετρίως	1UUU_
969 πρὸς τὴν ἐμὴν ἀνάγκην	0_000_
εἰρημέν' ἐστίν. σὰ δέ μοι,	<u> </u>
970 φίλτατον, ὢ ίκετεύω,	_00_ 0
ἄνοιξον ἀσπάζου με∙ διά	5 <b>U</b> _UUUU
τοι σὲ πόνους ἔχω.	_00_0_

Two choriambic tetrameters and an iambic dimeter and dochmius. The dochmius is here admirably adapted to express the emotion of the singer, and occurs in just this form, in connection with iambics, elsewhere in Aristophanes in passages of intense feeling, in comic imitation

or parody of tragedy. Cf. Ach. 1219, 1221; Nub. 1163, 1164; Vespae 730 = 744 (200\_0 | 500\_0 ) and 873 = 890. On the form of the fifth colon, see p. 4 f. In 970, & iκετεύω is a case of synizesis, since the resolution of either long of the choriamb (here it would be \_\_\_\_\_) is unheard of in Aristophanes, except in parody (pp. 11 ff.).

### Acharnenses 1150-1161 = 1162-1173

1150	'Αντίμαχον τὸν ψακάδος	1	_00_	_00_	
	τόν ξυγγραφη τον μελέων ποιητήν,			_00_	<b>∪_</b> <u>∪</u>
	ώς μὲν ἀπλῷ λόγῳ, κακῶς		_00_	U_U_	
	<b>έ</b> ξολέσειεν δ Ζεύς ·			<b>U_</b> _	
	ος γ' έμε τὸν τλήμονα Λή-	5	_00_	_00	
<b>11</b> 55	ναια χορηγων ἀπέλυσ' ἄδειπνον.			_00_	<b></b> _
	ον ἔτ' ἐπίδοιμι τευθίδος		<u></u>	·0_0_	
	δεόμενον, ή δ' ωπτημένη		<u>-</u> 0000	<b>_</b> _0_	
	σίζουσα πάραλος ἐπὶ τραπέζη κειμένη		000	0 <u>0</u> 00_	ピー
	οκέλλοι· κότα μέλ-	10	U		
1160	λοντος λαβεῖν αὐτοῦ κύων				
	άρπάσασα φεύγοι.			U	

Two choriambic pentameters enclosing a tetrameter, followed by two iambic hypermetra. The close of the first iambic hypermetron is marked by hiatus in the ode and by syllaba anceps in the antode. The contrast in form between the iambic hypermetra is admirably adapted to heighten the comic effect of the sentiment. The triseme syllable at the beginning of an iambic dipody (10, 12) is now clearly established by the authority of Aristoxenus.<sup>1</sup>

Cf. Schol. E (cod. Estensis III D 8) on 1150 ff.: διπλη καὶ ἡ τῶν δμοίων δυὰς ἔχουσα τὰς περιόδους δωδεκακώλους τὸ πρώτον χοριαμβικὸν δίμετρον ἀκατάληκτον τὸ β΄ ἐν μὲν τῆ πρώτη περιόδω ἐστὶν ἰαμβικόν, ἐν δὲ τῆ δευτέρα περιόδω χοριαμβικόν, ἔστι δὲ συγγενὲς τῷ τοῦ ἰαμβικοῦ τὸ τρίτον, χοριαμβικόν ἐφθημιμερὲς τὸ τέταρτον.

Elmsley, objecting to the correspondence in 2, proposed  $\tau \delta \nu \mu \epsilon \lambda \epsilon \omega \nu$   $\tau \hat{\omega} \nu \mu \epsilon \lambda \epsilon \omega \nu$  for  $\tau \delta \nu \xi \nu \gamma \gamma \rho \alpha \phi \hat{\eta} \tau \delta \nu (\tau \hat{\omega} \nu R) \mu \epsilon \lambda \epsilon \omega \nu$  of the Mss. The form of colon 2 in the ode recurs in Ran. 213.

<sup>&</sup>lt;sup>1</sup> See Grenfell and Hunt, The Oxyrhynchus Papyri, Part I, IX (p. 15, Col. II).

Isolated choriambic periods and single cola are found elsewhere in the comedies, as the tetrameter Aves 1724 f. at the close of an iambotrochaic series; the catalectic trimeter Ran. 213; the catalectic dimeter, at the close of a trochaic period in each case, Eccl. 902 = 908, 905 = 910; and the succession of catalectic dimeters, Pax 785-787 = 807-809, in transition to dactyls.

Choriambic cola and periods occurred in other plays of Aristophanes, no longer extant, and in those of other poets of the Old Comedy. Hephaestion (30, 21 ff.) quotes the Αἰολοσίκων (10 Kock):

#### Cf. Eupolis, Κόλακες 163 (Kock):

δς χαρίτων μεν όζει	_00_	V
καλλαβίδας δὲ βαίνει,	_00_	<b>U_</b>
σησαμίδας δὲ χέζει,	_00_	<b>U_</b> _
μῆλα δὲ χρέμπτεται.	_00_	<b>U</b> _

The last colon, in appearance, is the catalectic form of the preceding cola. The sentiment precludes the dochmius. See above, p. 8 f.

Pure acatalectic dimeters occur among the fragments of Aristophanes in 11 and 533 (K.). A tetrameter, quoted by Hephaestion (31, 16), occurred in the 'Αμφιάρεως (30):

```
οἶδα μὲν ἀρχαῖόν τι δρῶν = 00 = 00 = 00κοὖχὶ λέληθ' ἐμαυτόν. = 00 = 00 = 00
```

This has been called "first Priapean" (p. 4). It occurs not infrequently in Aristophanes in extant plays. Cf. Ach. 1152 f. = 1164 f., Nub. 512 f., 567 f. = 599 f., 957 f. = 1032 f. In the Kólakes of Eupolis (159) it is used by line in a fragment of sixteen verses. Cf. also Eupolis 38 and 361.

<sup>&</sup>lt;sup>1</sup> This combination has been much discussed, and it is thought by some scholars to be the basis of the forms of scoliastic verse that are found in Eccl. 941 = 945 and Vesp. 1245-1247. See p. 17 below.

Cratinus used the pentameter in the Πυλαία (172). Cf. Lys. 328 f. = 342 f., and in varying form Ach. 1150 f. = 1162 f., 1154 f. = 1166 f. In the Lysistrata (319, 320) Aristophanes employs two catalectic choriambic tetrameters to introduce the parodos of the women:

λιγνὺν δοκῶ μοι καθορᾶν		
καὶ καπνὸν ὦ γυναῖκες	_00_	U
ώσπερ πυρὸς καομένου·		_00_
σπευστέον έστὶ θᾶττον.	_00_	U

He has the same verse elsewhere: Nub. 700 f. = 804 f., 949 f. = 1024 f., 951 f. = 1026 f., Lys. 327 = 341, Eccl. 970 = 974. The iambic syzygy which begins the period has the fixed constitution \_\_o except twice, where it is o\_o. Anacreon had used the verse in a freer form (frag. 24):

ἀναπέτομαι δὴ πρὸς "Ολυμ-	000000_
πον πτερύγεσσι κούφαις	_00_ 0
διὰ τὸν Ἔρωτ' οὐ γὰρ ἐμοὶ	000000_
παῖς ἐθέλει συνηβᾶν.	_00_ 0

The metricians were here in doubt as to the constitution of the first foot. Did it result from the resolution of a choriambus or of a pure iambic dipody? Cf. Heph. 31, 6 ff.: 'Ανακρέων δὲ ἐπετήδευσε τὴν πρώτην συζυγίαν δι' ὅλου ἄσματος ἐκ τριβράχεος καὶ ἰάμβου ποιῆσαι, ὡς εἶναι κοινὴν λύσιν τῆς τε χοριαμβικῆς καὶ τῆς ἰαμβικῆς. Cf. Schol. Heph. 181, 14 ff.

Aristophanes can have felt no objection to this form in itself, since he employs it in the iambic part of mixed choriambic cola, not only in dimeters (Vesp. 1453 = 1465, 1455, 1456 = 1468, Lys. 324, 325), but also in a trimeter (Thesm. 992 f.), and in a pentameter (Lys. 328 f.); but in a well-known passage, with rare humor, he has used Anacreon's peculiar tetrameter 'with variations' to travesty the extravagances of the dithyrambic poet Cinesias. In Aves 1372 f. he introduces Cinesias singing the very words of the lyric poet:

```
1372 f. ἀναπέτομαι δὴ πρὸς Ὁλυμπον πτερύγεσσι κούφαις •
```

Hereupon the comic poet immediately begins to ring all possible changes (they are all impossible according to his own practice) on the

form of the choriambus, by means of resolution and contraction. He has Cinesias first display his complicated art by a variation in the first foot of a verse that certainly was not Anacreontic:

Cinesias is rudely interrupted by Peithetaerus, but continues, varying the first and second feet:

He is again interrupted, but now with a warm welcome, and goes on heartily, with iambic and antispastic variations:

He continues with renewed spirit, in spite of remonstrance, introducing the following interrupted 'heptameter' by a catalectic Telesilleum and ending it with broken Ionics (anaclasis):

(ωόπ says Peithetaerus, but the poet forges ahead:)

And finally makes a triumphant finish in two finely variegated tetrameters whose choriambic tone is nevertheless skillfully preserved:

Since Aristophanes himself never resolves either long of the choriambus nor contracts its shorts, his audience would be quick to appreciate the inimitable skill with which he genially brought the resources of metric into the service of his art as comic poet.

#### II Antispastic Cola

Since G. Hermann's assault upon the antispast and his celebrated invention of a "basis," scholars have fought shy of this much abused foot and it has disappeared from the modern books. Hermann, to be sure, could not completely abandon the choriamb, and in his hands Sappho's  $\kappa\alpha\tau\theta\nu\alpha'$   $\kappa\alpha\tau\theta\nu'$   $\kappa\alpha\tau$   $\kappa\alpha\tau\theta\nu'$   $\kappa\alpha\tau$   $\kappa\alpha\tau$   $\kappa\alpha\tau$   $\kappa\alpha\tau$   $\kappa\alpha\tau$   $\kappa\alpha\tau$   $\kappa\alpha\tau$   $\kappa\alpha\tau$   $\kappa\alpha\tau$ 

Hephaestion, however, who had no premonition of the advanced investigations of the nineteenth century, and apparently found nothing in antecedent practice to give him pause, recognizes antispastic metre and devotes a chapter to it. This begins (32, 15 ff.): τὸ ἀντισπαστικὸν τὴν μὲν πρώτην συζυγίαν ἔχει τρεπομένην κατὰ τὸν πρότερον πόδα εἰς τὰ τέσσαρα τοῦ δισσυλλάβου σχήματα· τὰς δὲ ἐν μέσφ, καθαρὰς ἀντισπαστικάς· τὴν δὲ τελευταίαν ὁπότε ἐστὶν ἀκατάληκτον, ἰαμβικήν· ἐὰν δὲ ἀναμίσγηται ταῖς ἰαμβικαῖς, οὖ μόνον τὴν πρώτην συζυγίαν ἔχει τρεπομένην κατὰ τὸν πρότερον πόδα, ἀλλὰ καὶ τὴν ταῖς ἰαμβικαῖς ἑπομένην. ἔστι δε ὅτε καὶ λύεται ὁ πρότερος ποὺς εἰς τρίβραχυν. It is important to note what the variable four-syllabled element is that under this definition begins the ἀντισπαστικὸν μέτρον. It may be υ\_\_υ or υυυυν οτ υυνυν στον Τhese are all antispastic 'syzygies;'

<sup>&</sup>lt;sup>1</sup> It has been treated with downright contumely. T. Reinach speaks of it as "l'horrible antispaste," and in general it is viewed askance by the new school, but possibly it may be rehabilitated. It is at least true that Westphal's statement that the antispast was invented by Heliodorus can no longer be maintained. See Grenfell and Hunt, *The Oxyrhynchus Papyri*, Part II, CCXX (p. 45, Col. VIII, and p. 47, Col. XIV).

in distinction from the rest, the first is designated as  $\kappa a\theta a\rho a$ . We shall discover that Aristophanes denied himself the use of one of those forms ( $00_0$ ), but that Euripides added even a sixth ( $00_0$ ). By Hephaestion's definition, the second syzygy of an acatalectic antispastic dimeter is iambic.

Equites 
$$973-976 = 977-980 = 981-984 = 985-988 = 989-992 = 993-996$$

Cf. the analysis of this lyric in the scholium in V: κορωνίς, εξίασι γὰρ οἱ ὑποκριταί, καὶ ἐν εἰσθέσει τοῦ χοροῦ ἑξὰς μονοστροφικὴ τετράκωλος οὖσα (τετρακώλους ἔχουσα Thiemann) τὰς περιόδους ἐκ τριῶν Γλυκωνείων καὶ τοῦ Φερεκρατείου, συνῆπται δὲ τἢ λέξει καὶ μόνον διακέκριται τὸ Φερεκράτειον, παράγραφοι δὲ ἀπλαῖ (Dübner, ἀπλοῖ V) μὲν έ, ἡ δὲ ς΄ καὶ μετὰ κορωνίδος. Hephaestion also designates this acatalectic dimeter as Γλυκώνειον (33, 9) and the catalectic form as Φερεκράτειον (33, 5). Cf. the definition of the pure Glyconic given by the scholiast on Hephaestion (213, 17 ff.). The antispastic dimeter (Glyconic), precisely as the choriambic dimeter and the iambic dimeter, normally consists of eight syllables and twelve times.

Bentley proposed the reading of 975 for the unmetrical τοῖσιν ἀφικνουμένοισιν of the Mss., and in 981 Scaliger 'γένεθ' for γένοιθ'. Musaeus supplied the ầν that was lacking in 989.

#### Ranae 1251-1260

	τί ποτε πραγμα γενήσεται;	1	<b>U</b> UU_L	,u_u_
	φροντίζειν γαρ έγωγ' έχω,			U_U_
	τίν ἄρα μέμψιν ἐποίσει		000_0	· · · · ·
	ἀνδρὶ τῷ πολὺ πλεῖστα δὴ			U_U_
1255	καὶ κάλλιστα μέλη ποιή-	5		U_U_
	σαντι τῶν μέχρι νυνί.			U
	θαυμάζω γὰρ ἔγωγ' ὅπη			U_U_
	μέμψεταί ποτε τοῦτον			<b>U_</b> _
	τὸν Βακχεῖον ἄνακτα,			U
	καὶ δέδοιχ' ὑπὲρ αὐτοῦ.	10		<b>U_</b> _

The acatalectic antispastic dimeter (Glyconic) occurred also in the  $\Gamma \hat{\eta} \rho as$  (140 K.), and the hephthemimeral form (Pherecratean) in continuous series in the  $Ko\rho u \nu \nu \omega$  of Pherecrates (79), quoted by Hephaestion (33, 5):

ἄνδρες, πρόσχετε τὸν νοῦν	 <b>U</b>
έξευρήματι καινῷ,	 <b>U</b>
συμπτύκτοις ἀναπαίστοις.	 U

#### Cf. Eupolis 162, Crates 33.

The catalectic antispastic tetrameter, with the second syzygy iambic and with iambic close (a combination of Glyconic and Pherecratean) was named Priapean (Heph. 34, 15 ff.). Cf. Cratinus 221:

οὐδ' Αἰξωνίδ' ἐρυθρόχρων	 U_U_
<b>ἐ</b> σθίειν ἔτι τρίγλην	 <b>U_</b> _
οὐδὲ τρυγόνος, οὐδὲ δει-	 U_U_
νοῦ φυὴν μελανούρου —	 <b>U_</b> _

Cf. Cratinus 320, and Ran. 1257 f., Nub. 573 f. = 605 f., Thesm. 1141 f. Choriambic and antispastic cola may be combined in successive series, as follows:

## Equites 551-564 = 581-594

1 _00_ 0_0_
-00- <u>7</u> -0
_00_ 0_0
_00_ 0_0
5 _00_ 0
_00_ 0_0_
_00_ 0_0_
_00_ 0

560 δελφίνων μεδέων Σουνιάρατε,	100 00 0_5
ὦ Γεραίστιε παῖ Κρόνου,	
Φορμίωνί τε φιλτατ' ἐκ	
$ au$ ῶν ἄλλων τε $ heta$ εῶν ᾿ $\mathbf{A} heta\eta$ -	U U_U
ναίοις πρός το παρεστός.	0 0_0

Cf. the scholium in V: διπλη, είτα ἐπάγεται ἐπιρρηματική συζυγία, ής αι μεν μελικαι (Thiemann, μέλη και V) περίοδοί είσι ιδ΄ κώλων· τὸ πρῶτον χοριαμβικὸν ἴαμβικὴν ἔχον ἐπιμεμιγμένην ἀκατάληκτον, καὶ τὸ  $\beta'$  ὅμοιον ἀκατάληκτον, καὶ τὸ  $\gamma'$  καὶ τὸ δ' ὅμοιον, καὶ τὸ  $\epsilon'$  χοριαμβικὸν καταληκτικόν (Thiemann, ἀκατάληκτον V), καὶ τὸ ς΄ καὶ τὸ  $\zeta'$  ἀκατάληκτον (δμοιον V), καὶ τὸ η΄ καταληκτικόν, τὸ δὲ  $\theta'$  καὶ ί αντισπαστικά τρίμετρα καταληκτικά (Thiemann, καὶ τὸ η΄ ακατάληκτον καὶ τὸ  $\theta'$ , τὸ δὲ ι΄ ἀναπαιστικὸν τρίμετρον καταληκτικὸν V), τὰ δὲ λοιπὰ δ΄ ἀντισπαστικὰ δίμετρα (Thiemann, ἀναπαιστικὰ τρίμετρα V), τρία μεν Γλυκώνεια, το τελευταίον δε Φερεκράτειον. The corrections are obvious. Cf. the Aldine scholium: διπλη, εἶτα ἐπάγεται ἐπιρρηματική συζυγία ής μελικαὶ (μέλη καὶ Ald.) περίοδοί εἰσι ιδ' κώλων· ὧν τὰ μὲν ὀκτὼ χοριαμβικὰ ἰαμβικὴν ἔχοντα ἐπιμεμιγμένην ἀκατάληκτον καὶ καταληκτικὴν ώς  $\dot{\epsilon}$ ν τ $\dot{\varphi}$   $\dot{\epsilon}$  καὶ  $\dot{\eta}$ . τ $\dot{\varphi}$ ν δ'  $\dot{\epsilon}$ ξής  $\dot{\epsilon}$ ντισπαστικ $\dot{\varphi}$ ν τ $\dot{\epsilon}$  μ $\dot{\epsilon}$ ν θ΄ καὶ ι΄ τρίμετρα καταληκτικά, τὰ δὲ λοιπὰ δίμετρα ἀκατάληκτα Γλυκώνεια διτροχαίου καὶ διιάμβου (ἰάμβου Ald.) πλην τοῦ τελευταίου έφθημιμερούς, δ καλείται Φερεκράτειον. By this classification, cola 9, 10, are catalectic antispastic trimeters, as in Eccl. 917 = 923 (p. 19). Hephaestion designates the middle syzygy of such metres as  $\kappa \alpha \theta \alpha \rho \dot{\alpha}$ αντισπαστική (32, 17 f.). The acatalectic form is the well-known Asclepiadean (Heph. 34, 1 ff.). Weil classified cola 9, 10 as Ionics. See Bulletin de correspondance Hellénique, XIX (1895), p. 411. See also von Wilamowitz, Sitzungsberichte der Kön. Preuss. Akad. der Wissenschaften, 1902, p. 894. But if we take the variable forms of the first foot in antispastic metre into account, what shall be said in explanation of Ionic metres in which the first foot becomes on or or not to mention the possible out or even ou.? The same analysis applied to colon 14 (the well-known Pherecratean) would give an acatalectic Ionic dimeter (\_\_\_ ∪∪\_\( \sigma\) closing a period.

<sup>1</sup> Compare his Études de littérature et de rhythmique grecques (1902), p. 205 f.

A catalectic antispastic trimeter, with the second syzygy iambic, was called by the metricians Φαλαίκειον. Cf. Hephaestion 33, 17 ff., who quotes Cratinus (321):

```
χαῖρ' ὧ χρυσόκερως βαβάκτα κήλων, ____ υ_υ_ υ__ Πάν, Πελασγικὸν Ἄργος ἐμβατεύων. ___ υ_υ υ_υ_ υ__
```

This trimeter occurs also in the following (1, 2):

Ecclesiazusae 
$$938-941 = 942-945$$

```
εἴθ' ἐξῆν παρὰ τῆ νέᾳ καθεύδειν ____ υ_υ_ υ__ 
καὶ μὴ 'δει πρότερον διασποδῆσαι ___ υ_υ_ υ__ 
940 ἀνάσιμον ἢ πρεσβυτέραν υυ_υ_υ_ 
οὐ γὰρ ἀνασχετὸν τοῦτο γ' ἐλευθέρφ. __υ_ υ__υ υ_υ_
```

The correction of πρεσβύτερον, the reading of the Mss. in 940, is due to Bothe. For the apparent anapaest at the beginning of 3, see p. 7 f. above, but the metrical constitution of cola 3, 4, is uncertain. No part of this lyric may be taken as exemplifying the usage of Aristophanes, since he here adopts a traditional form of the scolium, which was an inheritance from an early time. Cf. the laughable use our poet makes of the Phalaecean in Vesp. 1226, 1227, 1248, and with colon 4 above, cf. Vesp. 1245–1247. These are the only instances of the combination of choriamb and antispast (in this order) in Aristophanes. — For a discussion of this form of the scolium, see von Wilamowitz, Aristoteles und Athen, II, 316 ff.

Aristophanes has used the Phalaecean, in conjunction with a preceding antispastic tetrameter, the greater Asclepiadean or Σαπφικὸν ἐκκαιδεκασύλλαβον (Heph. 35, 5 ff.), in parodying Alcaeus (frag. 84), in Aves 1410 ff.:

```
δρνιθες τίνες οΐδ' οὐδὲν ἔχοντες πτεροποίκιλοι, τανυσίπτερε ποικίλα χελιδοῦ;
____ υ__υ υ__υ υ__υ
```

Cf. v. 1415. Aristophanes uses the form oo in the first part of the antispastic syzygy both here (in 1412, 1415) and in Ran. 1324 in parody. With colon 1 cf. Vesp. 1238 (scoliastic). — In Mélanges

Henri Weil (1898, p. 449 ff.) von Wilamowitz argues for Ionic scansion also of the Phalaeceum. See also Schröder's analysis of the two Asclepiadeans in Philologus LXIV (1905), pp. 493 ff.

The free combination of choriambic and antispastic cola, without fixed discrimination of order, is illustrated by fragments of two of the lost plays of Aristophanes. Cf. 109:

Εἰρήνη βαθύπλουτε καὶ	1		,U	U_U_
ζευγάριον βοεικόν,		_00	'-	<b>U_</b> _
εἰ γὰρ ἐμοὶ παυσαμένῳ			<b>'_</b> .	
τοῦ πολέμου γένοιτο		_00	<b>'</b> —	U
σκάψαι κἆποκλάσαι τε κ	a <b>ì</b> 5		.u	U_U_
λουσαμένω διελκύσαι		_00	<b>'</b> -	U_U_
τῆς τρυγὸς ἄρτον λιπαρό	ον Ο	_00	<b>'</b> -	_00_
καὶ ράφανον φαγόντι.		_00	<b>/</b> _	<b>U_U</b>
Add 141:				
ὦ πρεσβῦτα, πότερα φι	<b>λείς</b> 1		_U	UUUU.
τὰς δρυπετεῖς έταίρας		_00	<i>,</i> _	<b>U_</b> _
ἢ σὺ τὰς ὑποπαρθένους,			.u	U_U_
άλμάδας ώς ἐλάας,		<b>_</b> U	<i>,</i> _	V
στιφράς; * * * * * *	5	;	**	* * * *
For 0000_ in 1, see p. 15.				
Cf. also 695, where the cola	are all catalectic:			
δστις έν ήδυόσμοις		_00	<i>,_</i>	U
στρώμασι παννυχίζων		_00	<i>,</i> _	U
την δέσποιναν έρείδεις.			_U	<b>U</b>
Cf. also Pherecrates 131:				
ά μαλάχας μεν έξερων,	1	_00	<i>'</i> _	U_U_
2° 6/ A				

### C

ά μαλάχας μεν έξερων,	1	_00_	u_u_
ἀναπνέων δ' ὑάκινθον,		000_0	·
καὶ μελιλώτινον λαλῶν		_00_	<b>U_U_</b>
καὶ ῥόδα προσσεσηρώς •		_00_	U_ <b>_</b>
ὧ φιλῶν μὲν ἀμάρακον,	5		U_U_
προσκινῶν δὲ σέλινα,			U
γελῶν δ' ἱπποσέλινα καὶ		<b>U</b> U	U_U_
κοσμοσάνδαλα βαίνων			<b>U_</b> _

```
ἔγχει κἀπιβόα τρίτον ____ υ_υ_
παιῶν', ὡς νόμος ἐστίν. 10 ___ υ__
```

Five tetrameters. The last three are Priapeans (p. 15).

Iambic and antispastic cola may be combined in successive series, as in the following:

### Ecclesiazusae 911-917 = 918-923

A song  $\delta\pi\delta$   $\pi o\rho\nu\epsilon io\nu$ ! This may account for the hiatus in 911 and some other irregularities in form and correspondence. It is not even certain that the two parts correspond as ode and antode; cola 3, 4 are lacking in what seems to be the antode.

I have adopted Dobree's reading of the trimeter (verse 914), for which R has καὶ τἄλλ' οὐδὲν μετὰ ταῦτα δεῖ λέγειν. In 921 read ὑφαρπάσαις with Scaliger for ὑφαρπάσαιο in R. In 916 I have omitted τὸν which is read in R before 'Ορθαγόραν, and in the next verse have read σεαντῆς for σαντῆς (R). On the form of colon that ends the lyric (7), cf. Eq. 559, 560 = 589, 590, and see p. 15 above. For 0.00 = 0.00 (6, 7) as the first syzygy in an antispastic colon, cf. Thesm. 996, the refrain 'Υμὴν ὧ Υμεναίφ (Av. 1736 = 1742, 1743, 1754), and Pherecrates 109, 4 (p. 25); 131, 7 (p. 18).

Choriambic, antispastic, and iambic cola are combined in the following:

## The smophoria zusae 990–994 = 995–1000

In 990, the reading of the Mss., εὖιον ὦ Διόνυσε, is doubly in fault. Neither here nor at the end of the ode can evior be right, and Diórvose (υυ\_υ) fails to correspond with κτυπείται. It is to be noted that all the cola in the lyric are catalectic. Enger reads  $\mathbf{E}\tilde{v}\iota\epsilon$ ,  $\tilde{\omega}$   $\Delta\iota\delta$ s  $\sigma\dot{v}$ , but involves the least change. For the correspondence in this case, cf. Vesp. 537 = 636 (p. 6). The third colon is a catalectic Pherecratean. This is singular, but it is paralleled by the catalectic prosodiac (Telesilleum), which is common, and is more likely than an assumed acephalous choriambic dimeter (u\_|\_uu\_). The ode determines the In the antode the Mss. read in 998 f. καὶ νάπαι πετρώδεις. The correction is due to Enger. In 994 Hermann proposed & evi,  $\epsilon \mathring{v} \circ \hat{i}$ ,  $|\mathring{\omega}|$   $\epsilon \mathring{v} \mathring{i}$ ,  $|\mathring{\omega}|$   $|\mathring{\epsilon} \mathring{v} \mathring{i}$ ,  $|\mathring{\omega}|$   $|\mathring{\epsilon} \mathring{v} \circ \mathring{i}|$   $|\mathring{\epsilon} \mathring{v} \circ \mathring{i}|$   $|\mathring{\epsilon} \mathring{v} \circ \mathring{i}|$   $|\mathring{\epsilon} \mathring{v} \circ \mathring{i}|$   $|\mathring{\omega}|$ ἀναχορεύων of the Mss.

With the preceding lyric, cf. the following.

#### Aves 676-684

	$\vec{\omega}$ $\phi i \lambda \eta$ , $\vec{\omega}$ $\xi o v \theta \acute{\eta}$ , $\vec{\omega}$	1	_00_	
	φίλτατον ὀρνέων		_00_	<b>U</b> _
	πάντων, ξύννομε τῶν ἐμῶν		0	<b>U_U_</b>
	υμνων, ξυντροφ' ἀηδοί,			<b>U_</b> _
680	$\tilde{\eta}\lambda heta\epsilon_{ m S}$ $\tilde{\eta}\lambda heta\epsilon_{ m S}$ $\tilde{\omega}\phi heta\eta_{ m S},$	5		U
	ήδὺν φθόγγον ἐμοὶ φέρουσ':			U_U_
	άλλ' ὧ καλλιβόαν κρέκουσ'			U_U_
	αὐλὸν φθέγμασιν ήρινοῖς,			U_U_
	ἄρχου τῶν ἀναπαίστων.			U

On 2, see p. 10.

Logaoedic, antispastic, and iambic cola may be combined:

## Thesmophoriazusae 1136-1159

	Παλλάδα τὴν φιλόχορον ἐμοὶ	1	_00_00	<b>000</b> _
	δεῦρο καλεῖν νόμος ἐς χορόν,		_00_00	
	παρθένον ἄζυγα κούρην,		_00_00	
<b>114</b> 0	η πόλιν ημετέραν έχει		_00_00	
	καὶ κράτος φανερὸν μόνη	5		U_U_
	κληδοῦχός τε καλεῖται.			U

```
φάνηθ' ω τυράννους
   στυγοῦσ' ώσπερ εἰκός.
   δημός τοί σε καλεί γυναι-
   κων έχουσα δέ μοι μόλοις
                                     10
1147 εἰρήνην φιλέορτον.
   ηκετ' ευφρονες ίλαοι,
                                         1149 πότνιαι, άλσος ές υμέτερον,
                                       οδ δη ανδράσιν ου θέμιτ' είσοραν
                                        _____
   όργια σεμνά θεοίν, ΐνα λαμπάσιν
                                     1154 φαίνετον ἄμβροτον ὄψιν.
                                       ______
   μόλετον έλθετον, αντόμεθ' δ
                                       UUU_UU _UU_
1156 Θεσμοφόρω πολυποτνία,
                                       εὶ καὶ πρότερόν ποτ' ἐπηκόω ἤλθετον, νῦν
                                        άφίκεσθ' ίκετεύομεν ένθάδ' ήμιν.
                                     20 00_00_ 00_0_ _
```

This ode is altogether singular among the lyrics of Aristophanes in respect to the number of logacedic cola that occur in it. On logacedics in the ancient sense, see p. 1. Here these are mainly catalectic tetrapodies (1-4, 13, 16-18) of the same value in time as the interspersed Pherecrateans and iambics. On the trochaic opening of cola 14, 17, see Arist. Quint., p. 32, 37 f. and 33, 30 ff. (Jahn). The logacedic movement at the close of the lyric (19, 20) is ascending (anapaestic).

In 1150 Bothe corrected θεμιτὸν (R); in 1158 Reisig ἀφίκεσθον (R).

G. Hermann (*Epitome*, p. 171, cf. *Elementa Doct. Met.*, p. 541) by numerous changes of the text attempted to establish correspondence of ode and antode between parts of this lyric. See also Reisig, *Coniectaneorum libri duo*, pp. xxi ff. and 302 ff.

Iambic, choriambic, antispastic, and logacedic cola may be combined in the same lyric, as in the following:

## Thesmophoriazusae 352-371

ξυ	νευχόμεσθα τέλεα μὲν	1	U_U_	UU <b>UU_</b>
πό	λει τέλεα δὲ δήμφ		U_UUU	<b>U</b>
τά	$\delta$ ' εὖγματ' ἐκγενέσ $ heta$ αι,		U_U_	<b>U</b>
$ au\dot{a}$	δ' ἄρισθ' ὄσαις προσήκει		<b>U</b> U_U_	U
356 VL	ιᾶν λεγούσαις ὁπόσαι δ'	5		_00_
ěξ	ιπατῶσιν παραβαίνουσί τε το <b>ὺς</b>		_00_	

	δρκους τους νενομισμένους			U_U_
<b>36</b> 0	κερδῶν οὖνεκ' ἐπὶ βλάβη,			U_U_
	η ψηφίσματα καὶ νόμον			U_U_
	ζητοῦσ' ἀντιμεθιστάναι,	10		U_U_
	τἀπόρρητά τε τοῖσιν έχ-			U_U_
	θροῖς τοῖς ἡμετέροις λέγουσ,			U_U_
	η Μήδους ἐπάγουσι γη			U_U_
366	κερδων ουνεκ' επὶ βλάβη,	14		U_U_
	ἀσεβοῦσ' ἀδικοῦσί τε τὴν πόλιν. ἀλλ'		UU_UU_	UU_UU <b>U</b> _
	[ὧ παγκρατὲς			
369	Ζεῦ ταῦτα κυρώσειας, ώσθ'			
	ήμιν θεούς παραστατείν			U_U_
	καίπερ γυναιξίν οὖσαις.			
	man up you and or a court			~ <b></b>

The ode begins with four and closes with three iambic cola. (On colon 4 see p. 8.) The transition is through choriambic cola (5, 6) to Glyconic, which are followed by a logacedic hexapody.

Bothe corrected ξυνευχόμεθα (R) in 1, Dindorf εὖγματα γενέσθαι (R) in 3, Hermann ἐξαπατῶσι (R) in 6 and ἀσεβοῦσιν ἀδικοῦσιν (R) in 15, and Bentley ἕνεκ' (R) in 8 (cf. 14). In 12 λέγουσ' is due to Suidas (λέγουσιν R), and in 14 κερδῶν to Reiske (χώρας R).

Hiatus in 8, 14. This is extremely rare at the close of the acatalectic dimeter.

Isolated antispastic dimeters occur in the extant comedies of Aristophanes, as Vesp. 319-322 ( $\tau\eta\rho o\hat{\nu}\mu\alpha\iota \kappa\tau\dot{\epsilon}$ .) in transition from prosodiacs to anapaests, and the refrain  $\Upsilon\mu\dot{\eta}\nu$   $\vec{\omega}$   $\Upsilon\mu\dot{\epsilon}\nu\alpha\iota$   $\vec{\omega}$ , Aves 1736=1742, 1743, following prosodiacs, and Aves 1754, at the close of a dactylic series.

#### III Polyschematist Cola

In all the cola thus far considered in this investigation the only other form that has occurred in combination with choriamb or antispast to constitute a colon has been the iambic syzygy. The choriambic colon, if not pure, is  $\epsilon \pi i \mu \kappa \tau o \nu \pi \rho \delta s$   $\epsilon \lambda a \mu \beta \iota \kappa a s$  (Heph. 30, 7); the antispastic colon always combines at least one iambic syzygy, acatalectic or catalectic, with the antispast or antispasts (Heph. 32, 15 ff.).

But there occurs also the combination of antispast with choriambus, in the order named ( $\overline{U} = \overline{U} = \overline{U} = \overline{U}$ ), the antispast now admitting an addi-

tional variation of form. Hephaestion fully recognizes and adequately describes this form of the dimeter in his account of the polyschematist Priapean (57, 14 ff.): τὸ Πριάπειον, οὖ μόνον ἰαμβικῆ τῆ δευτέρα χρώμενον, ἀλλὰ καὶ χοριαμβικῆ· καὶ τὸν ἀντίσπαστον ἔσθ' ὅτε, τὸν πρῶτον τοῦ παντὸς μέτρου, εἰς σπονδεῖον περαιοῦσιν, ἐάν τε ἀπὸ ἰάμβου ἄρχηται, ἐάν τε ἀπὸ τροχαίου, κατὰ τὸ δεδομένον, ἐάν τε ἀπὸ σπονδείου. Hephaestion here unequivocally designates the first syzygy as antispastic, notwithstanding its additional variation of form. It is, in truth, multiform. The opening movement may be not only ομ and μο and μο, but also ομο; the following movement is μο οτ μο. Hephaestion classifies these antispastic-choriambic dimeters, examples of which he found in Corinna, as 'polyschematist Glyconics' (58, 3 ff.). The forms that particularly struck his attention were συσμο μουμ and μουμ μουμ. Both frequently occur in comedy, especially the latter.

This form of the  $\delta i \mu \epsilon \tau \rho \sigma \nu$   $\mu \iota \kappa \tau \dot{\sigma} \nu$  occurs in 1457–1461 = 1469–1473 of the following lyric:

#### Vespae 1450-1461 = 1462-1473

<b>14</b> 50	ζηλῶ γε τῆς εὐτυχίας	1		_00_
	τὸν πρέσβυν οἱ μετέστη			U
	ξηρων τρόπων καὶ βιοτής.		<u>∪_</u> ∪_	_00_
	έτερα δὲ νῦν ἀντιμαθὼν		0000_	_00_
	η μέγα τι μεταπεσεῖται	5	⊻يتن	JU
	έπὶ τὸ τρυφῶν καὶ μαλακόν•		<u> </u>	_00_
	τάχα δ' ἂν ἴσως οὐκ ἐθέλοι.		<b>0000</b> _	_00_
1457	τὸ γὰρ ἀποστῆναι χαλεπὸν		UUU	_00_
	φύσεος, ην έχοι τις ἀεί.		UUU_U	_00_
	καίτοι πολλοὶ ταῦτ' ἔπαθον·	10		_00_
	ξυνόντες γνώμαις ετέρων		ე⊻	_00_
	μετεβάλλοντο τοὺς τρόπους.		∪∪Ū	∪

The first seven cola are mixed choriambic (1, 3, 4, 6, 7) or iambic dimeters (2, 5). The last five are 'polyschematist' dimeters. The normal form of catalexis in the latter, the last member of the dimeter being a choriamb, is seen in 12. Hephaestion is perfectly clear on this point. In speaking of catalexis in choriambic metre he recognizes not only an  $la\mu\beta\iota\kappa\dot{\gamma}$  κατακλείς but also a choriambic; the choriambic colon,

he says, has a close of its own (κατὰ τὴν ἰδίαν). Cf. 30, 8 ff.: ὑς ἐπίπαν δέ, ὅτε καταληκτικόν ἐστιν, εἰς τὴν ἰαμβικὴν κατακλεῖδα περαιοῦται, τοῦτ' ἔστιν, εἰς ἀμφίβραχον, ἢ βακχεῖον διὰ τὴν ἀδιάφορον. περαιοῦται μὲν γὰρ καὶ εἰς τὴν ἰδίαν, τὸν δάκτυλον ἢ κρητικόν.

The reading μεταπεσεῖται in 5 is due to Bentley. Here V has μεταπείσεται, and R μέγα πείσεται. In 9 φύσεωs is read in both R and V; Küster corrected this to φύσεος. In 12 both R and V have μετεβάλλοντο in the ode and κατακοσμῆσαι in the antode. On this anapaest, see above p. 8.

Pherecrates used this metre in the Κραπαταλοί (96):

τοῖς δὲ κριταῖς	1		_00_
τοῖς νυνὶ κρίνουσι λέγω,			
μὴ ἐπιορκεῖν μηδ᾽ ἀδίκως			_00_
κρίνειν, ἢ νὴ τὸν φίλιον			_00_
μῦθον εἰς ὑμᾶς ἔτερον	5		_00_
Φερεκράτης λέξει πολὺ τού-		<b>U</b> UU	∪∪_
του κακηγορίστερον.			_00

As Bergk surmised, this was probably the close of the  $\pi\nu\imath\gamma$ os of a parabasis, to which it would be admirably adapted. Cf. Pherecrates 95. Pherecrates employed this dimeter also in the \*Aypioi (13):

ἐνθρύσκοισι καὶ βρακάνοις	1		_00_
καὶ στραβήλοις ζῆν· ὁπόταν δ'			_00_
<i>ἥδη πειν</i> ῶσι σφόδρα,			_00
ώσπερεὶ τοὺς πουλύποδας			_00_
* * * νύκτωρ περιτρώ-	5	***-	_00_
γειν αύτων τους δακτύλους.			

### Cf. Eupolis 362.

This dimeter might be used in free combination with Glyconic cola, as in the Φοίνισσαι of Aristophanes (561):

στίλβη θ' ή κατὰ	νύκτα μοι	U U_U_
φλόγ' ἀνασειράζεις	$\epsilon \pi i \tau \hat{\varphi}$	00000_
λυχνείφ. * * * *		* ***

### Cf. Philyllius 5:

πάντα γὰρ ἦν	1	_00_
μέστ' ἀνδρῶν καὶ μειρακίων		 _00_
πινόντων, ὄμοῦ δ' ὁμάδῳ		 _00_
γράδι' ἦν μεγάλαισιν οἴ-		 <b>U_U_</b>
νου χαίροντα λεπασταίς.	5	 U

It might be used also in combination with both Glyconic and choriambic cola, as in Pherecrates 109:

ύπ' ἀναδενδράδων ἀπαλὰς	1	000_0	
ἀσπαλάθους πατοῦντες		_00_	<b>U_</b> _
έν λειμῶνι λωτοφόρφ,			_00_
κύπειρόν τε δροσώδη,		<b>U</b> U	<b>U_</b> _
κάνθρύσκου μαλακῶν τ' ἴων	5		U_U_
λείμακα καὶ τριφύλλου.		_00_	<b>U_</b> _

Three tetrameters, of which the second is a 'polyschematist' Priapean (p. 23). Cf. also Aristophanes  $\Gamma \hat{\eta} \rho \alpha s$  (142).

Aristophanes employs it in a similar manner, in transition from a choriambic colon to Glyconics (a Priapean), in the tenth colon of the following lyric, which begins with six choriambic cola followed by two dactylic cola in logacedic time:

## Nubes 563-574 = 595-606

563	ύψιμέδοντα μὲν θεῶν	1	_00_	U_U_
	Ζηνα τύραννον ές χορον		_00_	U_U_
	πρῶτα μέγαν κικλήσκω·		_00_	<b>U</b> .
	τόν τε μεγασθενη τριαίνης ταμίαν,		_00_	U_UUU_
	γῆς τε καὶ ἁλμυρᾶς θαλάσ-	5	_00_	U_U
<b>56</b> 8	σης ἄγριον μοχλευτήν ·		_00_	<b>U_</b> _
	καὶ μεγαλώνυμον ἡμέτερον πατέρ'		_00_00	_00_00
	Αἰθέρα σεμνότατον βιοθρέμμονα πάντων.		_00_00	
	τόν θ' ἱππονώμαν, δς ὑπερ-			_00
	λάμπροις ἀκτῖσιν κατέχει	10		_00_
	γῆς πέδον μέγας ἐν θεοῖς			U_U_
574	έν θνητοίσί τε δαίμων.			<b>U_</b> _

There is an almost perfect analysis of this lyric in the Aldine scholia.<sup>1</sup> With this should be compared the Byzantine scholia preserved in cod. Vat. 1294 and cod. Par. 2821.<sup>2</sup>

This verse was much affected by the comic poets. Cf. Cratinus 98:

παντοίοις γε μὴν κεφαλὴν ανθέμοις έρέπτομαι \_\_\_\_ λειρίοις, ρόδοις, κρίνεσιν, \_\_\_\_\_ κοσμοσανδάλοις, ιοις καὶ σισυμβρίοις, ἀνεμω-5 \_\_\_\_\_\_ νων κάλυξί τ' ήριναις, \_\_\_\_\_ έρπύλλω, κροκοίς, ὑακίν-\_\_\_\_ θοις, έλειχρύσου κλάδοις, \_\_\_\_\_ οινάνθησιν, ήμεροκαλ-\_\_\_\_ \_\_\_\_ 10 \_\_\_\_\_\_\_\_ λεί τε τώ φιλουμένω, ἀνθρύσκου \* \* \* \* \* \_\_\_\* \*\*\*\* \* \* ναρκίσσου φόβη \*\*-- -U-\_\_\_\_\_\_ τῷ τ' ἀειφρούρῳ μελιλώτω κάρα πυκάζομαι, \_\_\_\_\_ καὶ γὰρ κύτισος αὐτόματος 15 \_\_\_\_\_\_\_\_ παρὰ Μέδοντος ἔρχεται. UUU\_U\_U\_

<sup>&</sup>lt;sup>1</sup> Dindorf, IV, 1, p. 484; Dübner, p. 108 f.; Thiemann, p. 37 f.

<sup>&</sup>lt;sup>2</sup> See Zacher, Die Handschriften und Classen der Aristophanesscholien (1888), p. 634 f.

Cf. Cratinus 74, 318. Pherecrates also used the verse, as in 64:

```
κάτα μυροπωλείν τί παθόντ'
                                     1 _000__00_
άνδρ' έχρην καθήμενον
                                       ___ ___
ύψηλως ύπὸ σκιαδεί-
                                       φ, κατεσκευασμένον
                                       ____ ___
                                     5 000___00_
συνέδριον τοῖς μειρακίοις
έλλαλεῖν δι' ἡμέρας;
                                       _____
αὐτίκ' οὐδεὶς οὐδε μαγεί-
                                       _____
ραιναν είδε πώποτε,
                                       ____
οὖτε μὴν οὐδ' ἰχθυοπώ-
                                       _____
λαιναν. * * * * *
                                     10 ___** ***
```

Cf. also Pherecrates 29, 47, 122, 132, 191, Eupolis 78, 120, Aristophanes 54, 55, Plato 92, 169, Alexis 206 and 237. The last reads:

νῦν δ' ἵνα μη	1		
παντελῶς Βοιώτιοι		_v_ <sup>⊻</sup>	
φαίνησθ' εἶναι τοῖς διασύ-			_00_
ρειν ύμας είθισμένοις,			
ώς ἀκίνητοι φρεσὶ καὶ	5		_00_
βοᾶν καὶ πίνειν μόνον		v	
καὶ δειπνείν ἐπιστάμενοι			_00_
διὰ τέλους τὴν νύχθ' ὅλην		<b>U</b> UU	V <b>-</b>
γυμνοῦ $ heta$ ' αὑτοὺς $ heta$ ᾶττον ἄπαν-			_00_
Tes. * * * * * *	10	<u>∪</u> ***	***

The text of some of these fragments is uncertain. In colon 15 of Cratinus 98 the manuscripts of Athenaeus read καὶ κύτισος. Hermann proposed καὶ γὰρ, Porson κἀμοὶ, Meineke καὶ δηὰ. The resulting form (\_\_\_\_\_\_) is not found elsewhere. Likewise κᾶτα μυροπωλεῖν in the first colon of Pherecrates 64 is Casaubon's correction of καταμυροπωλεῖν. This gives \_\_\_\_\_ (for \_\_\_\_), which cannot be paralleled in Eupolidean verse.

The theory here advanced that the Eupolidean verse is a combination of the acatalectic and catalectic forms of the polyschematist dimeter seems to be established by the facts, and the verse, thus regarded, has its exact parallel in the pure Priapean, which combines Glyconic and catalectic Glyconic (Pherecratean). See p. 15. The ordinary explanation of this period found in modern books, that it consists of a poly-

schematist dimeter and catalectic trochaic dimeter, is not borne out by the facts and probably arises from an incautious interpretation of the account of it given by Hephaestion, as follows (59, 1 ff.): καὶ τὸ Εὐπολίδειον τὸ καλούμενον ἐπιχοριαμβικὸν πολυσχημάτιστόν ἐστιν, ἐν ῷ τὰς τροχαϊκὰς παρὰ τάξιν ποιοῦσι δέχεσθαι τὸν σπονδείον ἐνίστε δὲ καὶ ἀντισπαστικὸν καθαρὸν ποιοῦσιν, οἷον

εὐφράνας ἡμᾶς ἀπόπεμπ' οἴκαδ' ἄλλον ἄλλοσε. ὁ σώφρων τε χώ καταπύγων ἄριστ' ἠκουσάτην.

It is important to note, first, that Hephaestion's phrasing, "pure antispast," shows that he regards the 'trochaic' element also as antispastic (see p. 13 f.), and secondly, that the examples which he quotes make it clear that when he speaks of variations in the form of these 'trochaic' syzygies of the verse, he is thinking of the first half of it quite as much as the second. This understood, no exception need be taken to his account of it, especially in view of the brevity of statement that he imposed upon himself throughout his Manual. He is explaining the form of a polyschematist tetrameter in which he has observed two prevailing forms in the two cola that compose it, namely \_\_\_\_ \_\_\_ and \_\_\_\_ ou\_ in the first half and \_u\_u and \_\_\_ ou\_ in the second half, with important substitutes that take the forms 2222200and <u>u</u>\_<u>u</u> <u>u</u>. He might proceed from any one of these three sets of forms to explain the combinations of 'trochaic,' 'spondaic,' and antispastic elements that appear in the first and third syzygies, but the 'trochaic' is obviously the simplest. The assumption that the fundamental rhythm is trochaic would be erroneous, but is no doubt furthered by the form of κατάληξις, since -υ is the normal κατακλείς of both choriambic and trochaic metres.

Probably it is from this point of view that the verse named  $\mathbf{K}\rho\alpha\tau$ iνειον should be approached, as a combination of choriambic dimeter and polyschematist dimeter, but here in the *pure* form of the verse the 'trochaic' syzygy prevails in the third foot to the exclusion of all other forms. Hephaestion describes it as follows (55, 7 ff.): ἔστι γὰρ ἐκ χοριαμβικοῦ ἐπιμίκτου, τοῦ τὴν δευτέραν ἰαμβικὴν ἔχοντος, καὶ τροχαϊκοῦ ἐφθημιμεροῦς· He then quotes from Cratinus (324):

Εὖιε κισσοχαῖτ' ἄναξ, 1 \_\_\_\_ \_\_\_ χαῖρ' ἔφασκ' Ἐκφαντίδης, \_\_\_\_ \_\_\_\_

πάν α φορητά, πάντα τολ-	_UU_ <b>U_U_</b>
μη ὰ τῷδε τῷ χορῷ,	_0_0 _0_
π' ην Έενίου νόμοισι, καὶ	5 <u>_</u> UU_ U_U_
Σχοινίωνος, ω Χάρον.	

Cf. Cratinus 41, 327. Also Cratinus 9, 146, 210, where the text is uncertain.

ἄνδρες έταῖροι δεῦρ' ἤδη	_00_	
την γνώμην προσίσχετε,		_00
εἰ δυνατόν, καὶ μή τι μεῖ-	_00_	
ζον πράττουσα τυγχάνει.		

This is the only example now extant.

Finally there is a famous lyric in Aristophanes, with which we may fitly lighten the close of this investigation, that is designed to exhibit the 'extreme licence' of another great poet, the sources of whose shameless extravagances are first stated in preceding trimeters:

οὖτος δ' ἀπὸ πάντων μελοφορεῖ πορνωδικῶν, τοκολίων Μελήτου, Καρκινῶν αὐλημάτων, θρήνων, χορείων. τάχα δὲ δηλωθήσεται.

This lyric illustrates all the forms we have been considering—and some others!—as follows:

## Ranae 1309-1328

Αἰσ. ἀλκυόνες, αι παρ' ἀενάοις θαλάσσης .	_ 000_0	
1310 κύμασι στωμύλλετε,		_00
τέγγουσαι νοτίοις πτερῶν		U_U_

<sup>1</sup> μελοφορεί πορνφδικών Rogers: μέν φέρει πορνιδίων Mss.

```
ρανίσι χρόα δροσιζόμεναι.
                                                     UUUUUU_UU_
     αί θ' ύπωρόφιοι κατά γωνίας
                                                   5 _U_UU _UU_U
     είειειειλίσσετε δακτύλοις φάλαγγες
1315 ἱστόπονα πηνίσματα,
                                                     _000_ _00
     κερκίδος ἀοιδοῦ μελέτας,
                                                     ίν' ὁ φίλαυλος ἔπαλλε δελ-
                                                     UUU_U U_U_
     φίς πρώραις κυανεμβόλοις
                                                  10 ____
     μαντεία καὶ σταδίους,
1320 οἰνάνθας γάνος ἀμπέλου,
                                                      ____
     βότρυος έλικα παυσίπονον.
                                                     UUUUUU_UU_
     περίβαλλ' ὧ τέκνον ὧλένας.
                                                     UU__U U_U_
     δράς τὸν πόδα τοῦτον; Δι. δρώ.
Ai\sigma. \tau i \delta \epsilon; \tau o \hat{v} \tau o \nu \delta \rho \hat{q} s; \Delta \iota. \delta \rho \hat{q}.
Αίσ. τοιαυτὶ μέντοι σὺ ποιῶν
     τολμας τάμα μέλη ψέγειν,
     ἀνὰ τὸ δωδεκαμήχανον
     Κυρήνης μελοποιων;
                                                  20 ____
```

These jumbled quotations from Euripides are in truth a medley, not only of incongruous sentiments, but also of varied and, as Aristophanes believed, vicious metrical forms. The comic poet has managed to bring together in brief space a great variety of cola.¹ The first appears to be an extravagant variation of the Sapphic hendecasyllable (Heph. 43, 19 f.), the prefixed syllable striking the note that is heard more clearly in the trimeter that follows in the sixth colon. Cola 2, 7, 11, 17, are polyschematist dimeters, the first two with catalexis, as in the last half of the Eupolidean. These two are not pure catalectic trochaic dimeters, controlled by the colonic stress appropriate to trochaics. *Pure* trochaic cola have no business in this 'mixed' company! In 7, \_\_ooo\_ seems a wild extravagance, but it is identical in form with Casaubon's restora-

¹ The metrical constitution of some of these cola is necessarily doubtful, and the attempt to determine it can be no more than tentative in some cases. As to the first colon, Aristophanes has ἀείνων (U--) in Ran. 147, but ἀενάοις (-UU-) in Nub. 275. In Attic lyric poetry, including the lyrics of Euripides, ἀέναος is invariably -UUU. The colon, therefore, cannot be iambic (-UUU- UUU- U--). Nor can the second and seventh cola be classified as syncopated iambic dimeters, because of the short ultimates. No syllaba anceps occurs in the ode, in acatalectic cola, and hiatus occurs only in 4, where there is shift to a new theme.

tion of the first syzygy of Pherecrates 64, 1. (See p. 27.) Cola 4, 8, 13 are mixed choriambic dimeters. Colon 5 is logacedic, and 6 a Phalaecean, with the first syllable prefixed and trilled. The remaining cola are Glyconics.

When these cola are tested by the standard of the comic poet's own practice, his rival's reckless and shameful disregard of metrical form becomes apparent. A sufficient number of these cola are deformations, when judged by the severe and simple taste of Aristophanes, to damn the lyric as a whole. He himself never forces a syllable to do double duty, in order to secure a peculiar musical effect (6). He nowhere employs a mixed choriambic dimeter of the form output \_\_ou\_ (4, 13), nor polyschematist dimeters such as \_\_ou\_ \_ \_ou\_ (7) and \_\_ou\_ \_ou\_ (11, acephalous), nor Glyconics such as ou\_ \_ou\_ and ou\_ou\_ ou\_ (14, 16¹). It is the last two that Aeschylus, as the representative of Aristophanes, especially reprobates. As he holds them up to ridicule, with much humor he incidentally forces Dionysus to perpetrate a third monstrosity (15) of which Euripides presumably was never guilty.

Those parts of Greek Comedy, except prosodiacs (p. 2), which have been treated by eminent modern metricians as 'logacedic' have now been fully analyzed according to the doctrine of Hephaestion. The question naturally recurs with which this paper began. Do the lyrics and the stichic periods that have come under consideration consist, as Heliodorus and Hephaestion believed, of choriambic, iambic, antispastic, and polyschematist dimeters and trimeters, of the value, common to all, of 12 or 18 times, or are they 'logacedics' under the modern definition of that term, and is the movement throughout 'dactylic'? I do not propose to discuss this question, but simply to add a few words of explanation and comment.

That the current definition of logacedics does not rest on the authority of ancient metricians is generally conceded. Rossbach and Westphal state this fact, apparently with no thought that any other view can be entertained,<sup>2</sup> but Christ<sup>8</sup> cites Diomedes and Bassus and Goodell

<sup>&</sup>lt;sup>1</sup>  $\tau \ell$   $\delta \epsilon$ ; in R, V.

<sup>&</sup>lt;sup>2</sup> Allgemeine Theorie der griechischen Metrik<sup>3</sup>, pp. 352 and 355.

<sup>&</sup>lt;sup>3</sup> Metrik<sup>2</sup>, p. 459: "In der That ist der Choriambus nichts anders als eine katalektische daktylische Dipodie, und diese einfach natürliche Auffassung bricht selbst

appeals to Marius Victorinus<sup>1</sup> as grammarians who possessed the true doctrine on this important matter, and with varying clearness of apprehension regarded the rhythm of these metres as dactylic. These three Latin metricians all maintain the doctrine of the *metra derivata*. Marius Victorinus, to be sure, in one part of the composite work ascribed to him, accepts the nine prototypes which appear in Hephaestion and argues, it should be noted, the claims of antispastic metre with special vigor, but elsewhere he follows the rival system. Now it happens that the Pherecratean, if one disregards the variation of the first part of its first foot and allows here only the spondaic form, has

noch bei einigen Grammatikern durch, wie bei Diomedes, p. 508, und Bassus, p. 263." Diomedes in the place cited is writing *de versuum generibus* and says (Keil I, 508): "De choriambico: Choriambicus est qui constat choriambo pede, qui est ex longa et duabus brevibus et longa. huius exemplum est

ergo ades huc ambrosia de Veneris palude.

est in Horatio tale,

hoc deos vere Sybarin quid properas amando.

recipit hic in imo vel palimbacchium pedem, qui est ex brevi et duabus longis, vel amphibrachyn; qui est ex brevi et longa et brevi."

Bassus is writing *de Philicio metro* and says (Keil VI, 263 f.): "Philicius versus ex duplici pede constat, quem bacchicon musici, choriambicon grammatici vocant. habet longam et duas breves et longam, id est trochaeum et iambum. . . . exemplum eius tale est,

frugiferae sacra deae quae colitis mystica iunctaeque Iovi nefasto.

hunc hexametrum ex numero bacchico composuit Philicus, quo usus et etiam Archebulus, de quo auctore supra rettuli; clusit autem antibaccheo. numerus hic frequens est apud lyricos et praecipue apud Alcaeum, Sappho, Anacreonta. nascitur tamen et hic ab heroo, cuius dactylo primo, qui constat ex longa et duabus brevibus, si iunxeris sequentis dactyli uel spondei syllabam primam, facies choriambum hoc modo, 'arma virum,' et in sequenti versu 'Italiam.' ad summam pentametrum heroum, qui habet dactylos primos duos, velut hunc,

unde meus veniat mollis in ora liber,

adiectis duabus syllabis longis facies choriambicum ex heroo pentametro sic,

unde meus nunc veniat mollis in haec ora liber,

et

dum meus assiduo luceat igne focus

sic,

dum meus hic assiduo luceat hoc igne focus."

What light do Diomedes and Bassus here throw on the *rhythm* of choriambic metre?

1 Chapters on Greek Metric, pp. 225 ff.

precisely the metrical constitution of one of the forms with which the heroic hexameter closes (\_\_\_\_\_). This is, of course, a large 'if'; even conservative Aristophanes begins the Pherecratean with four interchangeable forms. Furthermore the Glyconic, if one fixes the form of its beginning in the same fashion as in the Pherecratean, and accounts its last syllable anceps and assumes it to be always short (it is always long in Aristophanes), has the metrical constitution of one of the forms with which the hexameter may open (\_\_\_oo\_oo). The Glyconic and Pherecratean, therefore, were a great resource for any metrician who was endeavoring to prove that Greek metres were derived from the heroic hexameter. Accordingly we find, in the prolix pages ascribed to Victorinus, all possible changes rung on his tiresome "sic te diva potens Cypri' and "grato Pyrrha sub antro." Not that he regarded the metrical constitution of the Glyconic as dactylic; three times in describing metres of Horace (and also elsewhere) he composes it of spondeus, choriambus, and pariambus (trochaeus, spondeus). But it was extremely useful to him in arguing for his fantastic and unhistorical theory of the derivation of metres. That is the purpose with which he rings the changes on the Glyconic, and one should be cautious in assuming that he has any other, namely that he believes and is endeavoring to show that the rhythm of this colon, as apart from its metre, is dactylic, a conception that in itself is not easy to grasp. There is a striking passage in the first chapter of his fourth book which seems

hoc glyconium metrum dicitur, quod constat ex spondeo choriambo et ultimo trochaeo vel eodem spondeo. commune hoc esse cum heroo trimetro, quod constat ex spondeo et duobus dactylis, cunctis in promptu est," etc. (Keil VI, 146, 147.)

ratione contraria sunt, si plenius consideres, ab heroo traducta sunt. et mehercules siquis excutere penitus velit, inveniet, ut supra diximus, omnia genera ab hexametro heroo et trimetro iambico derivata, quamvis et iambicum heroi sit traductivum, nec quicquam sine his per se posse subsistere. unde, ut diximus, haec duo metra ut elementa ceterorum ac semina habenda merito ac dicenda sunt. haec ita videri atque esse, ut diximus, si studiosa contemplatione exempla quae proponuntur adverteris, adprobabis. nam metrorum species, quamvis generis sui privilegio distinctae sint, tamen misceri inter se atque diversis communia effici ea videlicet ratione, qua cuncta, ut dictum est, ex eadem origine atque uno fonte derivantur, sic comprehenditur. legimus apud Horatium

sic te diva potens Cypri:

to show clearly what his sole purpose is in the prolonged argumentation of this chapter and of most of the third book. There is no hint here, or elsewhere, that he is rhythmizing. Whoever believes that he is must accept the consequence, and be prepared to find dactylic rhythm not only in antispastic and choriambic metre, but also in both the Ionic forms.<sup>1</sup>

Those who reject the doctrine of Heliodorus and Hephaestion sometimes speak in a light-hearted and semi-contemptuous way of the cola and periods recorded in the Manual as "paper-schemes," and assert that Hephaestion's mode of procedure, in determining the constitution of a metrical series, was to 'chop off' syllables four at a time, and, if at the end there was a remainder, to take refuge in brachycatalexis or hypercatalexis. This, of course, is pleasantry, as a glance at the metrical analyses of the lyrics discussed in this paper will show. Hephaestion was not ignorant of the allowed substitutions for normal forms in all these dimeters and trimeters, nor of the fact that, as the result of lawful substitutions, feet might contain five or even six syllables, and he had a singularly clear comprehension of the forms of catalexis. But this pleasantry recoils upon its projector, for it seems to be true that the lyrics of Aristophanes, at least, both here and elsewhere duly admit the measurement prescribed by the "schemes" of Hephaestion.

Finally objection is taken to the great variety and apparent irregularity of form in these cola, and it is asserted with confidence that they are not rhythmical.

The application of the 'logaoedic' theory obliterates in many of these cola, for example in the choriambo-iambic and the antispastic, the metrical identity of iambic syzygies that are recognized as iambic by Heliodorus and Hephaestion. But these iambic syzygies may, for the present, be dismissed. A sufficient number of unmixed iambic cola remain in the lyrics that have come under consideration above to point an important fact. These cola are free from admixture with choriambs or antispasts and are common ground both for those who adopt and for those who reject the 'logaoedic' theory and must be dealt with by both in the same manner; whether Hermann's 'anacrusis' is recognized or not does not affect the rhythm of iambic cola. Now it is precisely these iambic cola which show the greatest variety, and for that matter

<sup>&</sup>lt;sup>1</sup> Marius Vict. VI, 127 and 128 (Keil).

But in what does this irregularity consist? The colonic stress in all these cola seems to be iambic. Iambic form, at least, prevails almost everywhere. It is exclusive in the considerable number of pure iambic dimeters that are freely combined, in the lyrics which have been analyzed above, with choriambic and antispastic dimeters; mixed choriambic dimeters and antispastic dimeters are themselves always ἐπίμικτα πρὸς τὰς ἰαμβικάς. This fact may indicate the way to the solution of the vexed question of the apparent irregularity of form and alleged lack of rhythm in these dimeters, and this solution may be approached most easily by consideration of the Glyconic. This, in its normal constitution, according to Hephaestion, is o\_\_o o\_o\_, antispast and iambic syzygy. The disturbance of the normal rhythm in this dimeter, assuming the rhythm to be iambic, may be accounted for by the principle with which we are familiar in modern music of inversion of rhythmic stress, or syncopation. In modern music the rhythmic beat falls on the note at the beginning of the measure; in ascending rhythm in Greek it falls on the note at the end. Adapting the form of statement to the Greek practice, syncopation in iambic rhythm was the process of inverting the normal rhythmic stress by beginning a tone on an accented beat and sustaining it into an unaccented one so that the proper emphasis was, in greater or less degree, carried forward to the latter.<sup>1</sup> Thus, whereas

<sup>&</sup>lt;sup>1</sup> Or, if stress in the modern sense did not exist in ancient Greek, syncopation in iambic rhythm, in which the down-beat follows the up-beat, was the process of inverting the normal order of arsis and thesis. I purposely avoid raising a question that has

the iambic dimeter in its normal form would be:

the Glyconic in its normal form becomes:

This inversion of rhythmic stress may extend to both parts of the antispast. The first part of this foot allowed substitutions. In Aristophanes these are - or -0 or -00. Of the four possible forms, three  $(-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2})$  are legitimate forms of the iambus in this place in the iambic syzygy. The fourth  $(-\frac{1}{2})$  shows shift of rhythmic stress  $(-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2})$ . This simple explanation of the Glyconic was offered many years ago by M. Henri Weil in an article in the Revue Critique, the importance of which has not, I think, been properly appreciated.

been vigorously discussed, especially in America, in its application to both Greek and Latin poetry. See Bennett and Hendrickson in the *American Journal of Philology*, XIX (1898), pp. 361 ff., and XIX (1899), pp. 198 ff., 412 ff., and Goodell, *Chapters on Greek Metric*, pp. 155 ff.

On voit qu'il y a trois syncopes dans ces deux mesures: nous avons mis un point sous les notes qui ont une moitié de leur valeur dans un temps et l'autre moitié dans le temps suivant. Mais les anciens, nous l'avons dit, ne scindaient pas ainsi les valeurs concrètes: aussi trouvaient-ils ici un assemblage de pieds contraires  $(\dot{a}\nu\tau\iota\pi\alpha\theta\epsilon\hat{i}s)$ , iambes et trochées, et ils battaient la mesure de manière à faire sentir la marche à contre-temps: système compliqué et qui dérouterait singulièrement un chanteur moderne. La rhythmique est fort développée chez les anciens, et on peut voir dans Aristide Quintilien combien ils étaient sensibles aux effets de rhythme: il ne faut donc

<sup>1</sup> Revue Critique, VI (1872), p. 49 ff. I quote from p. 52: "Je suis plus affirmatif aujourd'hui: je crois qu'il faut tout simplement adopter un témoignage confirmé par tous les métriciens anciens de quelque autorité, et que la seule chose qui nous reste à faire, c'est de traduire les expressions antiques dans le langage des musiciens modernes. Disons que les glyconiques sont des mesures à douze-huit, qui admettent au commencement de chaque membre de phrase vocal une syncope facultative et plus loin une syncope régulière.

The application of this principle to the other cola is simple, and clearly marks their differentiation from one another. The choriambic dimeter in its normal mixed and pure forms is , , , , and the entity of the antispast and choriamb as fundamental feet. Both are in  $\frac{6}{8}$  time and are in ascending rhythm. The former is a foot that usually occurs in combination with an iambic syzygy and is marked by shift of rhythmic stress always in the second half and sometimes also in the first. The choriamb, which is rarely used 'pure,' is always marked by shift of stress in the first half, never in the second. Syncopation in modern music, my colleague, Professor Spalding, informs me, always gives an enlivening effect; whatever the sentiment may be that is conveyed by the verses to which the music is set, and it may greatly vary, inversion of stress animates the melody. It is precisely the device, therefore, that we should expect to find applied in 'logaoedic' verse, which, to characterize it briefly, is a vigorous metre of all work.

That the Heliodorean and Hephaestionic doctrine of metres assumes a ποὺς δωδεκάσημος or ὀκτωκαιδεκάσημος as the unit of measurement in rhythms in  $\frac{6}{8}$  time is obvious. The dimeter, in particular, prevails everywhere, not only in the metres considered in this paper, but also in lyric iambic and trochaic metres and in the iambic and trochaic tetrameters of recitative verse. Among these the mixed cola of 'logaoedic' metre, it may be conceded, are complex. As M. Weil has remarked in his luminous explanation of the Glyconic, Greek rhythmic was a highly developed art. The embarrassment and difficulty, however, which we

pas s'étonner que les syncopes aient été multipliées dans leurs compositions musicales." M. Weil has here inserted bars in such manner as to mark off one complete colon of twelve times, beginning as in modern music with the strong accent. See also his Études de littérature et de rhythmique grecques (1902), pp. 181 ff. and 203 ff. — The 'logaoedists' have their own peculiar difficulties with this unruly variable element at the beginning of the Glyconic. Cf. the first and third editions of Rossbach and Westphal's Griechische Metrik, ed. I, p. 479 ff. (Rhythmus<sup>1</sup>, pp. 151 ff.), and ed. 3, p. 542 ff.

moderns, with little if any feeling for quantity, may experience in rendering these cola, without the music, is surely not sufficient ground on which to assert that a Greek, as he sang them, may not have felt them to be as rhythmical and melodious as pure dactylic or pure iambic series.



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# **Evidence from Experimental Psychology for the**Rhythm and Metre of Greek Verse

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In the traditional philological paradigm of Classical scholarship, questions of theory were largely taken for granted: the theoretical framework of scholarly investigation was thought to be implicit in the textual evidence and so obvious to everyone that it did not merit overt analysis. A highly theoretical topic like the nature of rhythm would have seemed esoteric: certainly it is not a question that the standard handbooks of Greek metre, particularly those with positivist underpinnings, were apt to confront. In recent years, Classics has begun to shed its aversion to theoretical discussion and at the same time has sought a greater degree of integration with a range of related disciplines. So the time has perhaps now come for Classical metrics to access the results of a century of psychological investigation of rhythm.¹ In fact, the a priori exclusion of this information is rather paradoxical, since the Greeks were themselves pioneers in the theoretical study of rhythm and explicitly confronted many of the fundamental problems of the field, as will be illustrated en passant at appropriate points in the ensuing discussion.

#### 1 The internal clock

Greek metres are quintessentially temporal patterns: they develop through time and their constituents are temporally defined; that is, they are patterns of time in time (Povel 1984).<sup>2</sup> Temporal patterns were one of the early concerns of experimental psychology in the nineteenth century, and although they have

<sup>&</sup>lt;sup>1</sup>We are grateful to *TAPA*'s reviewers, who included an experimental psychologist, for suggestions and revisions; we are responsible for remaining errors.

²ρνθμὸς τοίνυν ἐστὶ σύστημα ἐκ χρόνων κατά τινα τάξιν συγκειμένων. (Aristides Quintilianus 1.13 W[innington-]I[ngram]: "Rhythm is a system of times put together according to some order.")

been intermittently neglected in more recent times, an important body of knowledge has accumulated. Early work was partly motivated by an interest in verse rhythm—for instance, one section of a 1905 article by Stetson is entitled "The rhythm of verse and of prose"—while more recent studies are often conducted from the point of view of the organization of memory or the perception and production of music. Temporal patterns are a subset of serial patterns, having their own specific properties. In temporal patterns, the intervals between the stimuli, and often the stimuli themselves, are temporally defined. Not all temporal sequences of stimuli are patterns; they can be random unpatterned strings. Not all temporal patterns are rhythmic.3 Rhythm implies some regularly occurring event, although accelerating and decelerating patterns can be learned and reproduced by synchronized tapping with some degree of accuracy (Ehrlich 1958). Although the term rhythm is often used loosely to refer to any regularly occurring event like the succession of day to night or the "rhythm of the seasons," in its technical sense rhythm is often taken to imply a patterned temporal sequence in which the stimuli occur with a frequency within the range of about 8 to 0.5 events per second, or with durations in the range of 120 to 1800 milliseconds (henceforward msec). Slower stimuli tend to be perceived as discrete events not joined to each other in a rhythmic pattern. Faster recurrence leads to various other perceptions such as vibration or tone. In principle, rhythm is not restricted to any one modality.<sup>4</sup> Rhythm is particularly associated with the auditory modality. Coding and reproduction are more accurate for (nonlinguistic) temporal patterns presented auditorily than for similar patterns presented visually (Glenberg et al. 1989), and, more generally, memory for both content and order was better when a list of items was presented auditorily than when it was presented visually (Drewnowski & Murdock 1980). Arrhythmia can be supramodal, discrimination and reproduction being impaired when rhythm is presented via hearing, sight, or touch (Mavlov 1980).

In any motor task—be it speaking, reciting verse, scratching one's head, or running the quarter mile—we need to produce movements whose order is sequenced, whose duration is timed, and whose force is regulated. If someone

<sup>&</sup>lt;sup>3</sup>πιθανὸν μὲν οὖν καὶ χωρὶς λόγου, τὸ μὴ πᾶσαν χρόνων τάξιν εὔρυθμον εἶναι. (Aristoxenus, *E[lementa] R[hythmica]* 8 P[earson]: "It is clear without argument that not every arrangement of times is rhythmical.") οὐ γὰρ πᾶσα χρόνων σύνθεσις εὔρυθμος. (Psellus, *Prolambanomena* 3 P[earson]: "Not every combination of times is rhythmical.")

 $<sup>4\</sup>pi$ ας μὲν οὖν ἡυθμὸς τρισὶ τούτοις αἰσθητηρίοις νοεῖται· ὄψει, ὡς ἐν ὀρχήσει· ἀκοῆ, ὡς ἐν μέλει· ἀφῆ, ὡς οἱ τῶν ἀρτηριῶν σφυγμοί· (Aristides Quintilianus 1.13 WI: "All rhythm is perceived by these three sensory modalities: sight, as in dance; hearing, as in song; touch, as the pulse of the arteries.")

is asked to tap his finger at a tempo of his own choice, the tempo chosen will vary greatly from one person to the next, unless they are identical twins, but one and the same person will be surprisingly consistent from one tapping session to another. An interval of about 600 msec between taps is fairly typical. Maximum tapping speed varies according to the part of the body doing the tapping and is in the range 160-205 msec per tap (Keele & Ivry 1987). The phenomenon of spontaneous tapping tempo tells us a number of important things about rhythm. First of all, rhythm is preferred to arrhythmia. In fact, when subjects were asked specifically to tap as irregularly as possible, they found it difficult to do so (Fraisse 1946). Secondly, as just noted, humans are predisposed to perform repetitive motor actions at a specific frequency falling within the range of frequencies perceived as rhythmic. Thirdly, and even more fundamentally, they have the ability to compute that frequency; in other words, spontaneous tapping implies some sort of internal clock.

Not only do people tap with spontaneous rhythm, they can also tap in time to a metronome or march and dance in time to music or work in time to a worksong: in general, this computational ability permits the synchronization of social activity (Shaffer 1982). What is interesting is that when a subject taps to a completely random and unpatterned temporal sequence, the tap follows the signal; just as in most human behavior, the reaction follows the stimulus. But when one taps to a regular series of sounds, the tap is synchronized with the sound (with some degree of variability, which will be discussed below): in fact, the tap occurs about 30 msec prior to the stimulus, suggesting that what is synchronized is the auditory and the tactile perception. Tapping after the sound is more difficult, particularly when the interval between stimuli is less than 1000 msec (Fraisse 1966; Fraisse & Voillaume 1971). If the experimenter delays one of the stimuli, the tap will occur at its rhythmically predictable point in time. The subject anticipates the stimulus in order to synchronize his tap with the stimulus. He has learned the pattern and is using it to perform the task of synchronization.

There is considerable evidence that humans can efficiently perform only one rhythmic motor task at a time. When subjects pressed one telegraph key with the left hand and another with the right hand in response to two different rhythms, the respective tapping rhythms interfered with one another unless they were harmonically related (Klapp 1979). A similar interference was found when tapping and repeating the syllable *la* to different rhythms (Klapp 1981), or when tapping and reciting a nursery rhyme (Peters 1977). A related

difficulty was found with the perceptual monitoring of two temporal sequences (Klapp et al. 1985).

#### 2 The metrical elements

Perhaps the most basic question in Greek metrical theory is how to define the metrical elements. Since Greek metre is quantitative, many theorists have automatically assumed that the longum and breve are temporally (quantitatively) defined, as their names imply. This leads immediately to the question of what specific temporal relations are involved—absolute durations, a temporal ratio, a range of durations or of ratios? Other theorists have taken the position that it is inappropriate to seek either a temporal or a proportional definition for the metrical elements: implicit in their position is a more abstract, nontemporal definition of the elements as strong and weak or plus and minus; this view implies that the metrical elements are encoded and stored in memory without any specifically temporal features, and, a separate point, not in terms of any clearly defined quantitative value or ratio. The question is not whether temporal patterns can be represented at this level of abstraction—they clearly can, since a temporal pattern can routinely be translated into a spatial pattern; rather, the question is whether this level of abstraction is the normal way for temporal patterns to be processed or whether it is only accessed for special purposes. It is important to realize that defining the metrical elements abstractly as strong and weak does not eliminate the question of the nature of the temporal relations of the elements: it just shifts it from that part of the metrical processor which defines the intrinsic features of the elements to that part which specifies the rules for mapping categories of language or speech onto the metrical elements. To put it more concretely, if longum is not temporally defined, then some sort of temporal quantification will be required in the rules specifying what sorts of syllables can implement the longum in acceptable verses: how do the syllables that can implement the longum differ from those that cannot? Just the same possibilities present themselves at this point as those noted above for the other theory: absolute duration, temporal ratio, or range of durations or ratios? So the implication of representing the pattern elements abstractly as strong and weak would be that these temporal pattern elements do not share the durational properties of the linguistic categories that implement them.

In the following exposition, we shall take the most straightforward view, namely, that the metrical elements are temporally defined; the point of the above remarks was to argue that the temporal properties of rhythm are basic to

any discussion of quantitative verse irrespective of the position adopted in this particular theoretical dispute and irrespective of the formalism chosen to represent the metrical elements in the medium of typography.

It is fairly obvious that absolute durations are not used to define temporal pattern intervals. If they were, the same pattern would be judged to be two different patterns at two slightly different rates of delivery.<sup>5</sup> It follows that the intervals of temporal patterns are not simply perceived and stored as strings of absolute durations, but are represented in terms of one another, that is, relationally.6 Pattern elements are represented in our minds in more abstract terms than the physical measurement of their occurrence in our natural environment. Consequently, we need to know what properties characterize and constrain this abstract representation. Are all relationships rhythmically satisfactory? If not, which ones are better than the others? For instance, are ratios like 1:2 (.5) and 1:3 (.33) better than ratios like 2:5 (.4) and 3:4 (.75)? Is there a certain range of ratios that is better than other ranges of ratios? Is there a limit on the number of different ratios that can be efficiently processed as defining different pattern elements? The Greek tradition postulated a basic clock unit that could be used in increments of 100% only;7 the ratio of 3:2 was admitted for subconstituents of the foot but not as a clock division.8 It was demonstrated

<sup>&</sup>lt;sup>5</sup>εἴπερ εἰσιν ἐκάστου τῶν ῥυθμῶν ἀγωγαὶ ἄπειροι, ἄπειροι ἔσονται καὶ οἱ πρῶτοι [scil. χρόνοι]. (Aristoxenus, *Protos Chronos* P: "If the tempi of each rhythm are infinite, then the primary time units will also be infinite.")

δοὔτε γὰρ πόδας συντίθεμεν ἐκ χρόνων ἀπείρων, ἀλλ' ἐξ ὡρισμένων καὶ πεπερασμένων μεγέθει τε καὶ ἀριθμῷ καὶ τῆ πρὸς ἀλλήλους ξυμμετρία τε καὶ τάξει, οὔτε ῥυθμὸν οὐδένα τοιοῦτον ὁρῶμεν· δῆλον δέ, εἴπερ μηδὲ πόδα, οὐδε ῥυθμόν, ἐπειδὴ πάντες οἱ ῥυθμοὶ ἐκ ποδῶν τινων σύγκεινται. καθόλου δὴ νοητέον, ὃς ἄν ληφθῆ τῶν ῥυθμῶν, ὅμοιον εἰπεῖν ὁ τροχαῖος, ἐπὶ τῆσδέ τινος ἀγωγῆς τεθεὶς ἀπείρων ἐκείνων πρώτων ἔνα τινὰ λήψεται εἰς αὐτόν. (Ibid.: "We do not compose feet from infinite (indefinite) time units, but rather from time units that are definite and complete in both magnitude and number and in their commensurability, one to another, and in their order, nor do we see any such (infinite) rhythm. It is clear that if we do not have such a foot, we do not have such a rhythm, since all the rhythms ar composed of certain feet. In general, it must be realized that whatever rhythm be chosen, e.g., the trochaic, when it is set at a particular tempo, it will take for itself a certain one of the infinte number of primary time units.")

 $<sup>^7</sup>$ καλείσθω δὲ πρῶτος μὲν τῶν χρόνων ὁ ὑπὸ μηδενὸς τῶν ῥυθμιζομένων δυνατὸς ὧν διαιρεθῆναι, καταμετρούμενος, τρίσημος δὲ ὁ τρίς, τετράσημος δὲ ὁ τετράκις. (Aristoxenus, ER 10P: "Let the term primary time unit designate the one unit of time lengths that cannot be divided by what is to be rhythmicized; let the term diseme designate the unit that is measure twice as long as this, and the term triseme the unit three times as long.")

<sup>&</sup>lt;sup>8</sup>τῶν ποδικῶν λόγων εὐφυέστατοί εἰσιν οἱ τρεῖς, ὅ τε τοῦ ἴσου καὶ ὁ τοῦ διπλασίου καὶ ὁ τοῦ ἡμιολίου. (Psellus, *Prolambanomena* 9P: "The most natural of the ratios within feet are the three following: the equal [1:1], the double [2:1], and the hemiolic [3:2].")

almost half a century ago that when subjects are asked to produce patterns of five or six taps having an interval structure of their choice the durations of the intervals used fell into two categories only, one in the range of 200–300 msec and the other in the range of 450–900 msec (Fraisse 1946, 1956). A similar result was obtained when subjects were asked to reproduce patterns having unequal feet, which were described to them on a card in numerical representation (for instance, 322 representing a group of three taps followed by two groups of two taps). Each pattern produced used two intervals, a short interval averaging 320 msec for foot internal taps and a long interval averaging 645 msec for foot final taps; sometimes a dummy tap movement was inserted in the middle of the long interval (Essens & Povel 1985).

Another method used was to get the subject to imitate an auditory pattern by tapping. For instance, in one set of experiments, the stimuli were sequences of 150 msec beeps separated by varying intervals, which the subjects imitated by tapping on a small metal plate which likewise produced a beep (Povel 1981). Two patterns were used,  $\cup$ — and  $\cup$ ——, with the following ratios of intervals between the onsets of adjacent nonidentical tones: .25 (1:4), .33 (1:3), .4 (2:5), .5 (1:2), .6 (3:5), .66 (2:3), .75 (3:4), .8 (4:5). Only patterns in which the intervals stood in the relation 1:2 were correctly imitated. Furthermore, the errors in reproduction of the other ratios were not random: there was a systematic tendency for responses to move closer to a 1:2 ratio. For instance, a stimulus ratio of .25 would be reproduced as .33 and a stimulus ratio of .66 as .55. The subject is evidently aware that the ratio is not .5, but he underestimates or overestimates it in the direction of .5; he strives to represent complex temporal relationships in terms of a simple 1:2 metrical structure. Note that, whereas an interval of 250 msec was not perceived as a subdivision of a 750 msec interval in the sequence 250 750 250 750, it was so perceived (and, consequently, accurately reproduced) in the sequence 250 250 250 750. These results confirm that pattern intervals are not encoded in terms of absolute durations but relationally, and indicate that relations other than 1:2 are not favored.

In another study (Deutsch 1986), subjects were presented with a standard duration demarcated by a pair of blips (50 msec 1 kHz tones) followed after a certain interval by a comparison duration also defined by a pair of blips. The task was to judge whether the comparison duration was equal to, longer than, or shorter than the standard. Additional blips were interpolated in the interstimulus interval and the subjects were instructed to ignore them. However, when the interpolated intervals were somewhat shorter or longer than the standard, their judgment was distorted in the direction of the interpolated dura-

tions, but when they were in the range of half the standard duration, their judgment was distorted in the direction of *twice* the interpolated durations. Subjects' judgments were based on a metrical analysis and not on actual durations.

Music uses a much more complex system of durations than verse, but in one study of a variety of piano pieces it was found that in most cases two notes only, standing in a 1:2 ratio, accounted for over 80% of all notes and that among the remaining notes the longer ones tended to be demarcative (Fraisse 1956). When musically trained subjects listened to short musical sequences in which the durations of two notes were systematically varied, they tended to perceive the varying ratios categorically as 1:1 or 2:1 (Clarke 1987). When some of a group of musically trained subjects were asked to play intermixed doublets (two notes per beat) and triplets (three notes per beat) in time to a metronome, they were unable to play the triplets and reorganized them binarily as two sixteenth notes followed by an eighth note (Vos & Handel 1987).

What all this evidence suggests is that longum is discriminated from breve on the basis of a clock defined in terms of breve, and that there is some sort of psychophysical predisposition to a 1:2 ratio which may be expected to apply to quantitative metrical patterns too, since they are a type of temporal pattern. This predisposition was also found to apply to visual patterns when subjects graphically reproduced tachistoscopically presented rows of dots separated by different intervals (Fraisse 1956).

It should also be pointed out that the tendency toward a .5 ratio is not directly related to pure discriminability. There is no reason to assume that long intervals exceeding 200% of the clock interval should be more difficult to discriminate than intervals of 200%. As for intervals below 200%, it is traditionally assumed that intervals of roughly 110% of the standard are just noticeable, and the same holds for continuous stimuli like unseparated tones (Woodrow 1951; Lehiste 1970; Abel 1972); this leaves a range of 90% (110%) to 200%) unaccounted for. The just-noticeable delay in a pattern of otherwise isochronous tones was about 6% for intertone intervals of 200 msec and about 12% for intervals of 100 msec (Hirsch et al. 1990). Evidently, quite small differences in duration can be heard, but this ability is not what is used in recognizing temporal pattern intervals as same or different. This latter task seems to be approached in terms of assessing whether the ratio of one interval to the next involves one or two units of an internally computed metrical clock, what are called morae in phonology. When the experimental design forces subjects to compute ratios of duration, the just noticeable differences cited above are

not found. Subjects were able to distinguish iambic sequences consisting of noise bursts with the ratios of 1:2 and 2:3 from trochaic sequences with the ratios 3:2 and 2:1, but were not able to distinguish one type of iambic or trochaic sequence from the other. This was true whether the native language of the subjects was English or Estonian, which has ternary duration (Fox et al. 1987).

Although the point will be amplified below, it is worth remarking already at this juncture that both in the simple tone patterns of these psychological experiments and in the far more complex prosody of speech, the definitional 1:2 ratio is subject to modification reflecting the higher level hierarchical structure of the pattern, specifically the grouping of the pattern elements into rising or falling rhythms and the demarcation of higher level structures. These modifications need to be factored out in evaluating the accuracy not only of 1:2 ratios but also off 1:1 ratios in actual production tokens. Similarly, in music performance, the time values of notes are not precisely respected for a variety of reasons, including accent marking, demarcative decelerando, and expressive factors (Gabrielsson 1974; Bengtsson & Gabrielsson 1983; Clarke 1985). It follows that music is abstractly organized in terms of simple integral ratios and concretely implemented by complex nonintegral ratios. Just like quantitative verse.

## 3 Anceps

So far we have proceeded on the assumption that longum and breve are the only two elements of Greek stichic metre: anceps is interpreted as a position in the metron, namely, the noninternal arsis position, which can be filled by either of the two elements. There has been some controversy about the status of anceps: it is sometimes assumed that anceps is not merely a position but a separate third metrical element with a temporal value intermediate between that of breve and that of longum, thereby imposing a metrical rather than a rhythmical interpretation on the ancient doctrine of *alogia*. We have discussed this question elsewhere (Devine & Stephens 1975).

<sup>&</sup>lt;sup>9</sup>εὶ ληφθείησαν δύο πόδες, ὁ μὲν ἴσον τὸ ἄνω τῷ κάτω ἔχων καὶ δίσημον ἑκάτερον, ὁ δὲ τὸ μὲν κάτω δίσημον, τὸ δὲ ἄνω ήμισυ, τρίτος δέ τις ληφθείη πούς παρὰ τούτους, τὴν μὲν βάσιν ἴσην αὐτοις ἀμφοτέροις ἔχων, τὴν δὲ ἄρσιν μέσον μέγεθος ἔχουσαν τῶν ἄρσεων. ὁ γὰρ τοιοῦτος ποὺς ἄλογον μὲν ἔξει τὸ ἄνω πρὸς τὸ κάτω· ἔσται δ' ἡ ἀλογία μεταξὸ δύο λόγων γνωρίμων τῇ αἰσθήσει, τοῦ τε ἴσου καὶ τοῦ διπλασίου. καλεῖται δ' οὖτος χορεῖος ἄλογος. (Aristoxenus, *ER* 20P: "If two feet are chosen such that the first has its arsis equal to its thesis and each a diseme in length, and the second has its thesis of diseme

Our concern in the context of this paper is to evaluate the interpretation of anceps as a third metrical element in the light of what is known about temporal patterns in general. Note that in the following discussion reference is always to the abstract durational pattern of the iambic or trochaic metron defined in terms of the putative metrical elements breve, anceps, and longum, and not to individual instantiations of that pattern containing so called long or short anceps, that is, heavy or light syllables in anceps position. Two conditions can be envisaged. In one condition, which is the one envisaged by Aristoxenus in the passage cited in note 9, the temporal value of the longum in the foot containing the anceps is the same as it is in the foot containing the breve, so that the two feet of the metron are anisochronous. In the other condition, the duration of the longum in the foot containing the anceps is compensatorily adjusted so that the two feet of the metron are isochronous (no philological evidence has been adduced that would indicate a preference for shorter heavy syllables in the longum either of feet containing the anceps element or of feet which have heavy syllables in anceps).

There is one recent experiment that seems relevant to the anisochronous condition (Essens et al. 1985). In this experiment, subjects were asked to reproduce patterns of three anisochronous feet made up of tones and intervals, type  $\cup \cup - | \cup - | \cup - |$ , in which the ratio of the breve to the longum was varied through the range 1.5:1, 2:1, 2.5:1, 3:1, 3.5:1, 4:1. The patterns were imitated most accurately when the ratio was 2:1; ratios higher than 2:1 were underestimated in reproduction; the ratio 1.5:1, which is the one that most closely approximates the sort of ratio posited for anceps to breve, was reproduced as almost 2:1; subjects found it difficult to segment patterns with this ratio into feet and in their reproductions they lengthened the longer interval and shortened the shorter one. These results do not encourage the idea that elements standing in a ratio of 1.5:1 are very natural or very easy to discriminate in a temporal pattern of this type. However, the patterns used did not match the metrical distribution of anceps in that only two values were used in the patterns, whereas an iambic or trochaic metron would contain three elements—breve, anceps, and longum—if anceps were a metrical element. This problem does not occur in the experiment relevant to the isochronous condition

length and arsis half of that, and if some third foot is chosen alongside them, such that its thesis is equal to both of the others but its arsis has a magnitude in the middle of the two other arses; then such a foot will have an irrational ratio of arsis to thesis. The irrational will be midway between two ratios perceptible to the senses, i.e., the equal [1:1] and the double [2:1]. This is the irrational choree.")

(Essens 1986 amplifying Povel 1981). Here patterns contained four feet; in one set of patterns, one foot was divided  $^{2}/_{3}$ :  $^{1}/_{3}$ , while another foot was varyingly divided  $^{1}/_{3}$ :  $^{1}/_{3}$  or  $^{1}/_{2}$ :  $^{1}/_{2}$ . For instance, a structure having trimoraic feet  $^{1}/_{3}$   $^{1}/_{3}$   $^{1}/_{3}$   $^{1}$   $^{1}$  would be tested against a structure  $^{1}/_{2}$   $^{1}/_{2}$   $^{1}$   $^{1}$   $^{2}/_{3}$   $^{1}/_{3}$   $^{1}$ . The  $^{1}/_{2}$  value in the latter pattern is intermediate between  $^{1}/_{3}$  and  $^{2}/_{3}$  and splits the mora, giving a ternary division 1:1.5:2, which is comparable to that posited for breve, anceps, and longum. In the experiment, the patterns with the  $^{1}/_{2}$  valued intervals were not reproduced accurately either by subjects with extensive musical training or by subjects having no musical training. The pattern was not reanalyzed in terms of the nonoccurring lowest common denominator  $^{1}/_{6}$ .

In musical performance, dotted eighth notes tend to be lengthened and dotted sixteenth notes to be shortened (Gabrielsson 1974); recategorization of dotted notes was particularly associated with faster tempi (Clarke 1985). A fairly rapid twelve-beat sequence divided unevenly (for instance, 22323) is found in African lyrics (Jones 1964), and similar structures occur in Macedonian and Bulgarian folk songs (Singer 1974; Pressing 1983); in such sequences the divisions, as evidenced by hand clapping or the downward segment of dance movements, fall at anisochronous intervals, but there is no unit intermediate between one mora and two such as that posited by the anceps theory.

Despite the popularity enjoyed by the theory of anceps as a metrical element, we find it difficult to believe that large tracts of Greek verse were written in patterns using an element which the performer would have difficulty generating and which the audience would have difficulty perceiving.

#### 4 Feet<sup>10</sup>

## 4.1 Chunking

One of the best known and most fundamental characteristics of the human mind is its drive to relate and organize the information it is processing. For instance, subjects were presented with a list of sixty items belonging to four semantic

<sup>10</sup> δὲ σημαινόμεθα τὸν ῥυθμὸν καὶ γνώριμον ποιοῦμεν τῆ αἰσθήσει, πούς ἐστιν εἶς ἢ πλείους ἑνός. (Aristoxenus, ER 16P: "That by which we signal rhythm and render it perceptible to the sense is the foot, either one or more than one.") καὶ ἔστι ῥυθμὸς μὲν ὥσπερ εἴρηται σύστημά τι συγκείμενον ἐκ τῶν ποδικῶν χρόνων ὧν ὁ μὲν ἄρσεως, ὁ δὲ βάσεως, ὁ δὲ ὅλου ποδός. (Psellus, Prolambanomena 8P: "Rhythm, as just stated, is a system composed of podic temporal units, of which one is that of the arsis, another that of the thesis, and another that of the whole foot.") ποὺς μὲν οὖν ἐστι μέρος τοῦ παντὸς ῥυθμοῦ δι' οὖν τὸν ὅλον καταλαμβάνομεν. (Aristides Quintilianus 1.14WI: "The foot is a part of every rhythm through which we comprehend the whole.")

categories, e.g., animals, names, professions, and vegetables; the items in the list were in random order; when asked to recall the items, subjects reproduced them not in random order but in categorial clusters (Bousfield 1953). When a list is learned incrementally, with items presented one at a time, recall starts in the order of presentation, but after a few items have been presented, it is restructured into semantically categorial clusters (Mandler & Dean 1969). Categorial organization is not limited to relating items to each other at a single level by classifying them into equipollent categories: categorial structure can also be hierarchical. Recall was found to be better for a list of forty words consisting of four supercategories each containing two categories of five items each than for a list of forty words consisting of four categories of ten items each (Cohen & Bousfield 1956).

In other tasks, particularly those using strings of digits or letters, the subject is required to remember not only the number and content of the items but also their serial order; remembering telephone numbers is a comparable everyday activity. Because the error patterns for order-only recall were different from those for item-only recall, and because the former is independent of the memory load for the latter, it has been assumed that the two types of information are stored separately (Healy 1974, 1982). Nevertheless, changing order information can be just as grave as changing item information (Johnson 1970). The categories used to organize serial information are serial segments, or chunks as they are called. Interest in chunking was stimulated by the observation that, while the capacity of short-term memory was notoriously limited, it could be significantly increased if sequences of items were recoded into informationally richer chunks. Memory capacity then depended more on the number of chunks than on the total number of items in the sequence. For instance, when subjects were trained to recode strings of ones and zeros into digits representing two items each, e.g.,  $01\rightarrow 1$ ,  $10\rightarrow 2$ ,  $11\rightarrow 3$ , recall improved even more (Miller 1956). The tradeoff is that the recoding rules have to be learned and used.

There are various indications that a sequence has been recoded into chunks. After learning lists of twelve nonsense syllables that he organized into six accentual trochees, the subject learned a reordered list with the original feet preserved much more rapidly than one consisting of contiguous syllables across the foot boundary, indicating that the syllables had been coded as nonsense words (Mueller & Schumann 1894). A study of response times in alphabetic retrieval found that subjects chunked the alphabet in the same way as it is phrased in the alphabet songs taught in the nursery schools: they accessed the

earlier items of a chunk more rapidly than later items; this differential access suggests that a chunk exists and that it is unpacked from memory starting at the beginning (Klahr et al. 1983). When asked if a pair of letters was part of a previously memorized letter sequence, subjects answered more rapidly if both letters belonged to the same chunk than if they straddled a chunk boundary (Johnson 1978). Error patterns in recall are quite different for a chunked sequence and an unstructured serially associated sequence. In the latter, errors tend to cluster in the middle of a sequence; in the former they cluster at the beginning of chunks. Recall of the first item of a chunk implies recall of the following item in the same chunk more than recall of the last item in a chunk implies recall of the first item of the following chunk (Johnson 1970). Error probabilities at chunk seams are termed transition(al) error probabilities. Pause patterns in spoken recall are another indication of chunking: when subjects read and memorized groups of letters on file cards, in their spoken recall pausing between groups was longer than pausing within groups both in forward and in backward recitation of the list (McLean & Gregg 1967). Conversely, subjects report perceiving pauses at the end of accentually dactylic feet even though the stimuli were presented at a constant rate (Jones 1978). Pause in auditory presentation and space in visual presentation can be used by the experimenter to induce subjects to chunk a sequence in some particular way. The resulting chunk organization is an intrinsic part of the learned sequence: learning the letter sequence SBJ FQLZ was no faster for subjects who had previously learned SB JFQ LZ than it was for subjects who had previously learned an entirely different sequence (Johnson & Migdoll 1971). Similarly, a second presentation of a string of digits with different grouping was not recognized as a repetition of its earlier occurrence (Bower & Winzenz 1969); and the same effect was found with nonverbal material, namely, minimelodies of five tones each (not in key) (Dowling 1973).

The optimum length for a chunk has also been studied.<sup>11</sup> People find it difficult to segment sequential information into chunks larger than three or four items (Estes 1972); pausing patterns in free recall experiments also point to chunks of three or four items (Broadbent 1975). When subjects were presented with a list of digits and instructed to rehearse them in groups of varying sizes, recall improved as group size grew from one to two to three and deteriorated as it further increased to four and five; deterioration for groups larger

 $<sup>^{11}</sup>$ οὐ καθ' αὐτὸν ὁ ποὺς εἰς τὸ πλέον τοῦ εἰρημένου πλήθους [sc. τῶν τεττάρων ἀριθμῶν] μερίζεται. (Aristoxenus *ER* 19P: "A foot is not, *eo ipso*, divided into more than the number of parts stated [sc. four].")

than three affected serial order rather than item recall, suggesting that constraints on chunk size may be related to memory for order more than for item (Wickelgren 1964, 1967). Another study found, on the basis of transition error analysis, that four-item sequences were treated as single chunks by half the subjects and as two chunks by the other half, and that five-item sequences were almost invariably analyzed as either 2+3 or 3+2 (Johnson 1970).

## 4.2 Subjective rhythm

The letter and digit sequences that are used in many chunk studies are revealing because there are few potentially confounding objective properties of the stimulus to disturb the subject's choice of chunk size or reaction to grouping imposed by the experimenter. When the stimulus sequence is patterned, as it is in verse, the properties of the pattern are a primary factor conditioning grouping. In fact, pattern induction is such a basic cognitive activity that we have a propensity to look for and "find" patterns even when they are objectively not there. When presented with randomly sequenced binary events, subjects behave as though the stimuli were patterned and predict grouped subsequences of events (Simon & Sumner 1968). Our perception of isochronous auditory events having a frequency within the range of rhythmical perception tends not to be a string of equipollent elements; rather, we have the impression that the sequence is grouped into subsequences of two or three. The most familiar instance is the tick-tock (not, significantly, tick-tick) of a clock. The tick tends to give the impression of having greater intensity and less duration ("i" is often sound-symbolic of the diminutive) and the tock of having greater duration or of being followed by a longer silent interval, and the tick and the tock together give the impression of forming a group that is separate from preceding and following events. This perceptual characteristic may explain why alternating rhythm has been found when subjects tap in time with an isochronous tone and continue this synchronized tapping after the tone ceases. Finger taps produced under these conditions are not strictly isochronous; rather, there is variation such that longer taps tend to be either preceded or followed by shorter taps. This distribution was explained as arising mainly from unintentional variability in the motor execution of programmed isochrony (Wing & Kristofferson 1973a. 1973b; Wing 1980). Even though the variations in the motor execution of the taps are independent of each other, they will produce a nonrandom pairing of long-short or short-long taps in the following way. Two adjacent intertap intervals are affected by three motor delays. The first at the beginning of the first interval and the third at the end of the second interval are uncorrelated in their respective effects, but the second motor delay has opposite but exactly

equal effects on the two intervals: if it postpones the end of the first interval longer than the average, it necessarily postpones the beginning of the second longer than the average, and vice versa, so that longer intervals will be followed by shorter ones and vice versa; i.e., adjacent intertap intervals will be negatively correlated. Nonadjacent intertap intervals, however, not being affected by any one motor delay in common, would be uncorrelated. However, there is also an alternation in the force of the taps, and it has recently been suggested that the isochronous tone stimuli are preceived as temporally and accentually differentiated and, consequently, replicated with some degree of alternating rhythm in production; alternating rhythm implies foot structure (Nagasaki 1987a, 1987b, 1990). In experiments performed at the turn of the century, subjects were presented with sequences of twelve nonsense syllables and reproduced the sequence with stress on alternate syllables, grouping the resulting feet into hemistichs. When they suppressed their tendency to impose alternating rhythm on the sequence, the sequence had to be repeated twice as many times in order to be learned accurately (Mueller & Schumann 1894). A recent study of order permutation of sequences of visually presented nonsense syllables also revealed foot structure (Gordon & Meyer 1987).

## 4.3 Iambic and trochaic foot structure

Up to this point, we have considered the grouping of random sequences like letter sequences and the perceptual grouping of physically isochronous sequences of identical stimuli. However, many temporal patterns are made up of objectively differentiated repeating events. In an auditory pattern, the most obvious differentiating properties are intensity, duration, and frequency (how loud the sound is, how long it lasts, and what its pitch is). The relative contribution of these three parameters to grouping has been studied experimentally since the turn of the century. In one famous early experiment (Woodrow 1909), when subjects were presented with a regular series of sounds lasting 135 msec followed by a silent interval of 615 msec of which every alternate sound had greater intensity, they uniformly perceived trochaic rhythm; that is, the less intense sound was grouped with the more intense sound in such a way that the less intense sound ended the foot. The next step in the experiment was to increase gradually the duration of the silent interval following the more intense sound and correspondingly decrease the duration of the silent interval preceding the intense sound, thereby maintaining a constant clock measure for the foot. For instance, instead of having 615 msec following each sound, you would have 603 msec preceding and 627 msec following, or 547 msec preceding and 683 msec following. As this was done, the perception of trochaic

rhythm became progressively weaker until, passing through a neutral stage of ambivalent grouping, it began to change into iambic rhythm. The intermediate neutral stage was particularly interesting, because it could be used to measure the degree of change in duration that was required to counterbalance the contribution of any particular degree of intensity to the grouping of the stimuli. The effect of varying the durations of the sounds and their following silent intervals in the absence of any difference in intensity was also studied both in this early experiment and in more recent ones. In general, the longer the relative duration of the period from the onset of one tone to the onset of the next, the more likely that longer element is to sound accented and to end the group, that is, the greater the likelihood of iambic grouping. Starting with an isochronous sequence generated from 50 msec tones followed by 50 msec intervals, every second interval was gradually increased: subjects began to perceive groups of tones ending in the longer interval but with a comparatively weak accent on the first tone as soon as the longer interval exceeded the shorter interval by 5-10%. When the longer interval was further increased, the perceived grouping remained the same, but a strong accent was now reported on the second tone of the group; it required a fairly robust increase in intensity (4 dB) on the first tone to counterbalance this accent on the second tone and produce a perception of equal accents (Povel & Okkerman 1981).

Another interesting study (Vos 1977) varied both tone duration and silent interval. Half of the subjects were professional musicians and half philologists from the Department of Classics at the University of Nijmegen. The stimuli were strings of thirty pure tones all having the same frequency and the same intensity, except that the intensity was gradually increased from 0 dB to 40 dB over the first two seconds to minimize the orientation effect (see below). The first two tones and the first two following silent intervals were assigned durations of either 80 msec (short) or 320 msec (long), and the resulting pattern was repeated throughout the string. Subjects made a forced choice judgment as to whether the string was trochaic or iambic. When one of the tones was long and the other short, the long tone was judged prominent. When one tone was long and the other short and their intervals were identical (320<sub>80</sub> 80<sub>80</sub>), the string was judged iambic, i.e., the long tone was judged to end the foot. But when the long tone was followed by the short interval and the short tone by the long interval (320<sub>80</sub> 80<sub>320</sub>), the string was judged trochaic: the longer tone was prominent, but the longer interval demarcated the feet. When both tones were short but one interval was long and the other short (80<sub>320</sub> 8080), the tone followed by the longer interval was perceived as foot final and

so the string was judged iambic. The staccato nature of many of these experimental stimuli (as compared to the relatively legato prosody of speech, in which nondemarcative periods of silence are associated only with the closure portions of stop consonants) is very useful, since by uncoupling tone duration from silent interval duration, it tends to confirm the idea that whereas the strength of the signal cues the accent, the duration of the silent interval cues the end of the group. Consequently, the grouping of temporal patterns into feet is based on the gestalt principle of proximity (Koffka 1962) according to which closely spaced elements are more likely to be grouped together than distantly spaced elements as in the following visual pattern:

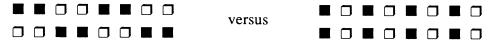


When subjects were asked to tap groups of three or four taps, they spontaneously separated the groups by pauses (Fraisse 1982). In another experiment already described above, when subjects were instructed to produce patterns described to them in terms of the number of taps per foot, they spontaneously used short intervals for foot internal taps and long intervals for foot final taps (Essens & Povel 1985). In the synchronized tapping to an isochronous tone described above, when the interval between tone onsets was in the range 250-375 msec, the grouping was accentually alternating with the accented element having longer duration; when the interval was in the range 200-250 msec, the grouping was accentually alternating with the unaccented element having longer duration (Nagasaki 1987a). When subjects were asked to synchronize taps with an isochronous series of sounds in which every other sound had greater intensity, the intervals between the taps varied due to two factors. The more intense sound induced a slightly longer interval, and this effect was considerably more robust when the series was perceived as having iambic grouping: trochees were tapped with 484 msec for the more intense sound and 452 msec for the less intense foot final sound, whereas iambs were tapped with 432 msec for the less intense sound and 520 msec for the more intense foot final sound (Fraisse 1956: 95).

It has also been suggested that foot demarcation in alternating rhythm is reflected in differential electrical activity (evoked potentials) elicited in the brain which can be recorded via electrodes placed on the scalp (care is needed in the interpretation of these results). It was found that the amplitude of event related potentials tended to decrease foot internally but to increase after a foot boundary pause, possibly reflecting a recovery of sensitivity during the pause period (Fraisse & Lavit 1986).

## 4.4 Orientation effect; run unity

In Greek, the difference between iambic and trochaic in the surface ratios of breve to longum apparently does not reflect a difference in the definition of either the metrical elements or the categories of linguistic syllable that can implement them: longum is implemented by heavy syllables and breve by light syllables in both iambic and trochaic verse, with the possible exception of the occasional responsion of a first paeon sequence with a trochaic metron in comedy, e.g., Wasps 1062-1093. Rather, the difference reflects properties of demarcation that are implemented as the elements are processed for production. It follows that, disregarding the effect of differences in the coincidence of word boundary with foot boundary, the crucial distinction between iambic and trochaic at the abstract pattern level must lie in how the pattern starts. It is pointed out in a number of experimental studies (Woodrow 1909; Fraisse & Oléron 1954; Handel & Yoder 1975; Povel & Okkerman 1981) that the pattern structure initially presented to subjects can determine the outcome of the analysis, and various strategies have been adopted to circumvent this orientation effect, such as instructing subjects to try both rising and falling rhythm or prefixing an extrametrical tone to the pattern. The orientation effect was studied with patterns of nine High and Low tones, type HLHHHLLLL, presented in continually repeating sequence with an interonset interval of 333 msec; subjects were more likely to use the starting pattern as their perceived pattern organization than any other analysis (Preusser et al. 1970). This orientation effect was also critical when subjects were asked to classify Dutch recited verses as iambic or trochaic (Loots 1980). One factor that can counteract the orientation principle is the tendency for sequences of like events to be grouped together: this is termed "run unity." In patterns similar to those just described, subjects rarely if ever analyzed the pattern as beginning in the middle of a string of identical sounds (Royer & Garner 1970). In comparatively unpatterned strings of binary events like 110000110, errors clustered at the ends of runs of like events, and recall depended on the number of runs in the sequence rather than on the number of events, indicating that runs were coded as chunks (Keller 1963). Run unity reflects a general gestalt principle that also applies to visual patterns, as in the following:



When taken together, run unity and the orientation effect suggest that pattern perception is a hypothesis testing activity that starts at the beginning of the stimulus and privileges hypotheses that do not require the pattern to start in the middle of a foot. Once a hypothesis is chosen, it is coded into memory: consequently, pattern violations are less serious at the beginning of a pattern than internally. Disruptions to an isochronous tone sequence were more easily detected when the disrupted sequence followed the regular sequence than when it preceded (Bharucha & Pryor 1986). Line initial freedom is a well-known property of verse. The initially chosen hypothesis can be discarded if later information indicates it was inadequate.

In metrical patterns, run unity implies that a series of amphibrachs will tend to be analyzed as dactyls or anapaests even if it begins with an amphibrach, provided the amphibrachs are presented continuously, that is, provided the amphibrach structure is not reinforced by demarcative pauses; the initial amphibrach is interpreted as anacrustic. This ties in with what we know about language and about Greek metre. Languages rarely if ever have amphibrach stress feet (Haraguchi 1991), and Greek does not have amphibrach stichoi. Conversely, when the reiterated demarcative effect of word boundary induces amphibrach grouping in dactylic, the result is a disfavored structure, as in the notorious ή δὲ χίμαιραν ἔτικτε πνέουσαν (Theogony 322) or the sound symbolic αὖτις ἔπειτα πέδονδε (Odyssey 11.598). The amphibrachic patterning of the word boundaries ("pause"-induced grouping) obscures the dactylic patterning of the syllable weights (run induced grouping). One study relevant to this phenomenon took a repeating eight element sequence of alternating tones such as HH LL HL HL; when pauses were inserted after even numbered tones, i.e. at the run induced foot boundaries, subjects almost always recognized the tonal pattern, but when pauses were inserted after every third element, thereby splitting the feet, the tonal pattern was only correctly recognized about half the time (Handel 1973).

## 4.5 Tempo

The grouping of tones into feet has been observed to depend on tempo in a number of different studies (Bolton 1894; Fraisse 1956; Handel & Oshinsky 1981; Povel 1984); the faster the tempo, the more tones are grouped into a foot. 12 Tempo likewise affects the identification of the beat in music perception (Madsen et al. 1986). When asked to tap to the perceived beat, musically

<sup>12</sup>διαφέρουσι δὲ οἱ μείζονες πόδες τῶν ἐλαττόνων ἐν τῷ αὐτῷ γένει ἀγωγῆ. ἔστι δὲ ἀγωγὴ ῥυθμοῦ τῶν αὐτῷ λόγῳ ποδῶν κατὰ μέγεθος διαφορά (Fragmenta Neapolitana 15P: "In the same genus, the greater feet differ from the lesser in tempo. The tempo of a rhythm is a difference in magnitude of feet which have the same ratio [sc. of arsis to thesis].")

trained subjects reacted to faster stimuli by tapping at half the presented rate and to slower stimuli by tapping at double the presented rate (Duke 1987 reported in Radocy & Boyle 1988). The processing of relatively rapid tempi having intertap intervals of about 250 msec may involve different mechanisms from the processing of slower tempi having intertap intervals of 500 or 1000 msec, since children younger than four years and a brain damaged subject synchronized well with the former but not with the latter (Kohno et al. 1991); speech syllables at ordinary speech rates fall into the former category.

#### 5 Metron

There was already some indication in the letter chunking studies that subjects were not confining their organization to a single level of coding. They not only coded letter sequences into chunks, but could also recode chunks into superchunks or subchunks. Transition error analysis for sequences like NGVHSB showed that some subjects chunked this NG VHSB, while others split the longer sequence into two chunks giving NG VH-SB (where the hyphen marks the binary division of a chunk into subchunks) rather than into the ternary structure NG VH SB with three equipollent chunks (Johnson 1970). In another study, subjects induced structures like J XC-PM by learning a set of rules for changing the order of structural units of the sequence; they were then able to apply these rules effortlessly to a different sequence of letters, indicating that they had correctly abstracted the hierarchical structure with its metron organization (Keeney 1969). Subjects presented with continuous sequences of evenly spaced identical sounds grouped them not only into feet but also into metra, and judged not only one sound in the foot to be stronger than the other but also one foot in the metron to be stronger than the other (Woodrow 1951). In rapid synchronized tapping at intertap durations below 200 msec, the grouping was into an accentually alternating metron with accented elements accorded longer duration, suggesting that at faster tempi feet encompass more taps and are then binarily subdivided (Nagasaki 1987a). When subjects tapped in time to a sequence of 6 isochronous tones in which the first tone was either raised or lowered in pitch, the fifth and either the first or the second intertap intervals were prolonged (Franek et al. 1991). The evidence cited in this section is sufficient to establish the metron as a structure available for the processing of serial sequences in general, even if it is not as exhaustively corroborated as the foot.

#### 6 Hemistich and stichos

The great potential power of multilevel hierarchical chunking was pointed out in early theoretical analyses (Mandler 1967). A comparatively long and prima facie complicated sequence can be generated by learning a few rules for unpacking progressively smaller superchunks. These rules can be considered as more flexible, abstract, and "intelligent" than the simple and naive strategy of associating a preceding item with a following one (Restle & Brown 1970). In one experiment, a six-item alphabet consisting of a row of six lights was used to present a 32-event sequence to subjects at a slow rate of about 4 seconds per event:

#### 12122323121223236565545465655454

This sequence is much less intimidating once one perceives its hierarchical structure, which is that of a regular binarily branching tree, just like a tetrameter except that there are six elements rather than two,

and, in fact, subjects were able to anticipate the pattern quite successfully (Restle 1970). Such sequences are learned more easily and with fewer errors than sequences that cannot be generated from a tree structure; and if such a sequence contains at some point an individual item that cannot be generated from a tree structure, that particular item will be difficult to learn and responses will often smooth out the irregularity, particularly toward the end of a subunit. Evidently, instead of storing each event sequentially in memory and recalling an event on the basis of its association with the preceding event, subjects encoded the sequence in terms of a few rules for iterating subpatterns in a hierarchical structure, or, to use metrical terminology, for generating metra out of feet, hemistichs out of metra, and stichoi out of hemistichs. Furthermore, the error rate at the metron boundary was less than at the hemistich boundary, and the error rate foot internally was the lowest of all: this distribution of error rates (lower within any domain than across the boundary between two such domains) indicates that subjects were using a hierarchical analysis and not sequential association or random chunking which would not have given rise to such a structured transition error distribution. One other result of processing the information in this way is that one would not have a tendency to produce sequences of thirty-one events or thirty-four events, as might be the case if the sequence were generated by counting to thirty-two each time or by chunking the sequence in a nonhierarchical sequential fashion. So the hierarchical structure of metrical patterns is also an inbuilt safeguard against errors like nine-foot tetrameters, notwithstanding the odd inadequate experimental subject or inscriptional poetaster.

The same tetrameter type structure was investigated with stimuli speeded up so that each light came on for 300 msec followed by an interval of 300 msec in the allegro presentation and 800 msec in the adagio presentation (Restle 1972). These intervals were then varied in such a way as to emphasize or to counteract the hierarchical tree structure. Pattern induction was improved by the former and hindered by the latter condition. Pauses improved pattern induction by demarcating the constituent structure and not merely by providing more time for processing, since rate of presentation was not critical. Hierarchical interval differentiation was a little better than no differentiation at all and much better than counter-hierarchical interval differentiation.

In finger tapping an eight-element sequence using the index and middle fingers with alternating hands, subjects organized the sequence as a binarily branching tree, since intertap intervals were greater between metra than between feet and greater between feet than foot internally (Rosenbaum et al. 1983); similar results were obtained with other tree structures and other finger combinations (Collard & Povel 1982).

## Concluding Remarks

What emerges quite clearly from the above review is that the structure of verse patterns is not unique to verse at all, but reflects very general properities of the psychological processing of patterns and particularly of rhythmical patterns. This leaves unanswered a further question, namely: how does verse become patterned? A simple preliminary hypothesis would be that the poet takes some unpatterned raw material—language—and arranges it into patterns according to basic general principles of pattern structure. Parts of the discussion above have been cast in these terms in order to simplify the exposition. So we cannot end without pointing out that such a hypothesis is deficient because it implicitly assumes that language is unpatterned and only becomes patterned in verse. In fact, language and speech themselves involve highly patterned prosodic structures. The more we find out about the prosody of Greek speech, the clearer it is becoming that the constituents of verse structure—syllables, feet, metre, hemistichs, stichoi-are simply more highly constrained, regularized or prototypical instances of prosodic constituents and domains that pre-exist in the Greek language. Verse entails not the arrangement of language into non-linguistic patterns but the constrained choice of the most regular instances of prosodic patterns and structures that occur systematically and naturally in language. So in relating the information reviewed in this paper to verse structure, we need to bear in mind that verse is not the creation of patterns out of language but a regularization of the patterns in language.

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Ancient Metre and Modern Musical Rhythm

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Take a modern instance. Prince Charles had to hide as a woman among women. He wore a frock of sprigged calico; part of it is preserved in the covers of the MS. Lyon in Mourning. He bore a female name, which is known—it was Betty Burke. All this occurred, not in Skyros, but in Skye. Are the anthropologists of the future to decide either that initiatory ceremonies were practised in 1746, or that the adventure of the Prince is an echo of that of Achilles, Skye taking the part of Skyros. A brutal question put by an English officer to Mrs.

Macdonald shows Flora Macdonald as Deidamia—of course this was a mere insolent suggestion. Clearly a young man may wear a girl's dress, and bear a girl's name, with no idea of taboo. Mr. Crawley's explanation is superfluous; granting the circumstances of the legend, all the rest follows naturally. People can invent a story with no basis in custom, though custom suggests stories, when its origin is forgotten, and it has to be explained.

ANDREW LANG.

#### ANCIENT METRE AND MODERN MUSICAL RHYTHM.

In the year 1785 fragments of a treatise on Rhythm by Aristoxenus of Tarentum, a pupil of Aristotle, were discovered in the library of St. Mark at Venice by Morelli, the custodian. Portions of the same work were known to exist in the Vatican Library, and were mentioned by Doni in 1647, at which time there were three books, only one of which now remains, but they were in such a fragmentary condition that they were looked upon as of little value. Hence, when Meibomius published in 1652 his Antiquae Musicae Auctores Septem, he omitted the Rhythm of Aristoxenus, and only published his Harmony, though to the modern musician the former is by far the more valuable of the two treatises. Morelli compared the fragments he discovered at Venice with those in the Vatican, and published them, together with the notes made on them by Michael Psellus in the eleventh century, and thus for the first time they were placed at the disposal of the learned world.

Another important publication was made by Friedrich Bellerman in 1841, of a treatise on music, founded on the writings of Aristoxenus, by an anonymous Greek writer of probably the second century of our era. In this are found fragments of the music of the Graeco-Roman period, consisting of some vocal exercises and six short examples of instrumental notation designed to illustrate the rhythm. These are easily translated into modern notation with the help of Alypius' tables, and though of no artistic value, they throw a good deal of light on the rhythm of Aristoxenus. The anonymous treatise also contains some

germs of that note grouping found in the Gregorian Neumes, the significance of which has of late years been so clearly demonstrated by Dom Pothier and other Benedictines. This book was also known to Meibomius though not published by him: and its value was recognized by Fétis, who mentions it in 1830 in the Revue Musicale as 'ce traité infiniment precieux.'

Aristoxenus, who flourished about 300 B.C., was a favorite pupil of Aristotle. His father was an eminent musician who made many visits to Greece, and was acquainted with the most famous of his contemporaries, particularly Socrates and Epaminondas. Aristoxenus himself became one of the greatest of musical theorists, but besides being a musician, he was a man of the widest culture and knowledge, and was a candidate for Aristotle's place in the Lyceum at Athens, which was however obtained by Theophrastus. His works on various subjects reached the number of 453, of which only a few have come down to us. That on rhythm was written from observations made by him on the works of the great poets and musicians of classical Greece. He lived at the time when classical music was beginning to be neglected, and its place was taken by the new dithyrambic music of Philoxenus and Timotheus, which merely aimed at tickling the ears of the ignorant populace, and was devoid of all lofty ideal, and his two treatises on music were written in a vain endeavour to bring back the classical style into popular favour. He and his friends used to cultivate in private the music of Aeschylus and Pindar, and lamented over its decay. 'We do the same,'

he says, 'as the dwellers in Paestum on the Tuscan sea. Formerly Greeks, they have now sunk into barbarism, and have become Tuscans or Romans, and have forgotten their old Greek language and culture. Only one of the ancient Greek festivals is celebrated by them; and this brings back to them their national names and customs, and they depart with tears and lamentations. So will we also, now that the theatre is sunk into barbarism, and the music of the crowd has descended to so low a level, meditate in our narrow circle on the ancient music as it once was.'

The ancient Greek poet was at the same poet and musician. Aeschylus, Sophocles, Pindar, and all those Greeks whom we have from our school days been accustomed to consider as great poets, were in reality great composers as well, and were considered as such by their contemporaries. The creation of the music and the text of a Greek play was carried out by the same hand, and the two acts were probably simultaneous. Of this practice Richard Wagner, the 'poet-musician,' is a modern representative. Unfortunately none of the Greek classical music has come down to us, with the exception of a somewhat doubtful fragment of the music of the first Pythic ode of Pindar, discovered by Kircher in the library of the monastery of S. Salvator near Messina about 1650; hence we have no means of knowing what Greek melodies were like, and Aristoxenus himself does not give us a single example.

With the rhythm however, the 'masculine' element of music, as Aristoxenus calls it, the reverse is the case. The texts which we possess of the Greek plays are in reality the texts of their operas or music dramas; and since the rhythm of their music depended on the metre of their words, we

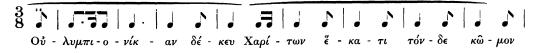
have, with the help of Aristoxenus, the means of knowing with almost absolute precision what the rhythm of their music was: and Rudolph Westphal, through his elucidation of the treatise of Aristoxenus, has shown us that the metrical forms of Greek poetry are almost identical with the rhythmical forms made use of by the The most greatest modern musicians. usual form of colon in modern music is that which contains four simple bars or feet, and Westphal says that this is also the most frequent form in Greek lyric poetry. But in order to break the monotony of a constant succession of tetrapodies, the Greeks intermingled with them dipodies, tripodies, and hexapodies; and modern composers do the same to a limited extent. Bach however introduces more variety of cola into his works than other composers; and in this he approaches the Greek ideal of

The threefold form of strophe, antistrophe, and epode in Pindar's epinikian odes finds an almost exact counterpart in most of the fugues of Bach's 'Wohltemperirtes Klavier,' the threefold construction of which is strongly marked by the tonality and the full closes. The modern 'sonata' movement has the same form on a very extended scale, the first part and its repetition corresponding with the strophe and antistrophe of the Greeks, and the second part with the epode.

There is not space here to give examples showing the strophic construction of modern music; but a few illustrations of the colon-construction of Greek poetry compared with that of modern music may not be unacceptable.

The ordinary period, consisting of two tetrapodic cola is shown in the following quotations from Pindar and Beethoven.

Pindar, Olympia iv. vv. 14, 15, Gildersleeve's edition:—



Beethoven, Sonata No. 14, allegretto (in  $\frac{3}{8}$  time for the sake of comparison. This produces no alteration in the musical effect):—



Dactylic Tripodies with Anacrusis.

Pindar, Pythia ix. line 7:-



Bach, Fugue No. 1, Bar 15, &c. :-



Dactylic Pentapody with Anacrusis, followed by a Tripedy.

Olympia viii. Epode a:-



Bach, Fugue No. 2, Bar 27:—



Examples might be multiplied indefinitely. The following rhythmical forms are rarer, though the 5 time foot occurs more frequently in the poetry of the Greeks than in modern music. Their finer instinct enabled them to appreciate the somewhat difficult proportion of 3:2 or 2:3 in the time occupied by the two portions of the foot more easily than we do.

Paeonic Dipodies.

Olympia ii. Line 8:---



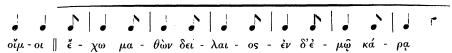
R. Wagner, Tristan and Isolde, Act. III. Sc. ii. :-



The dotted line across the stave shows the division of the bar into thesis and arsis. Wagner in the above example divides his bar in the ratio of 3:2 while in the passage from Pindar it seems to be 2:3.

A preliminary foot standing by itself at the beginning of the strophe before the commencement of the regular rhythm, called *epiphonema* by Westphal, is not at all uncommon in modern music. It differs from the anacrusis in that it is composed of a whole foot, while the anacrusis is only the weak portion of the foot.

Sophocles, Antigone 1271:—



Bach, Fugue No. 19 (Tripodic Trochaic Rhythmopoeia):-



Beethoven produces an overpowering effect in his third and fifth symphonies by the use of the epiphonema. In each case he gives it double force by repetition, and in the fifth symphony he uses it with anacrusis and with a pause; the 'irrational' time duration of Aristoxenus.

Beethoven, Symphony in C Min., No. 5:—



Many examples of epiphonema can also be found in vocal music, where the accompaniment has a single foot before the voice enters, e.g. Beethoven's 'Vom Tode.'

Aristoxenus gave no musical examples to illustrate his meaning, yet so much alike are ancient and modern rhythm that examples of nearly all the forms described by him can be supplied from the 'Wohltemperirtes Klavier' alone. Thus he speaks as follows of the six time bars. 'In the fourth place are the bars of the six time duration. Two kinds of bar are common to this megethos, the even and uneven. For of the three ratios which are given by the number 6, namely 3:3, 2:4, and 1:5, the last is not rhythmical; and of the two others, the isorrhythmic will come under the category of the dactylic or even species, and the displasic under that of the iambic or uneven species.'

Westphal 1 gives the following examples to explain this passage; the single 'time' being represented by the semiquavers, and its equivalent the metrical sign.

Six time Monopody or Ionicus as a  $\frac{3}{8}$  bar.

Bach, Wohlt. Kl., No. 11:-



<sup>&</sup>lt;sup>1</sup> Westphal Aristoxenus, Melik and Rhythmik, p. 41. Leipsic. 1883.

Here there are three six time feet, preceded by the anacrusis. The upper legato lines show the cola, the lower the single feet.

Six time Dipody as a  $\frac{6}{16}$  Bar.

Bach, Wohlt. Kl., No. 35:-



Here again each bar contains six times, but is divided into two three time feet.

'With regard to the names of the time-magnitudes, I call chronos protos, that which is incapable of being divided; chronos disemos, trisemos, tetrasemos, that in which the chronos protos is contained two, three or four times, and similarly for the remaining magnitudes up to the chronos pente-kaieikosa semos' (25 time magnitude).

In analyzing Bach's piano fugues it will be found that he almost invariably makes the short note (chronos protos) the basis of his time signature, and that in his fugues he very rarely divides it: and these works give examples of all the Greek poetic feet (except those in 5 time) in their fundamental forms; while in his other works, and in the music of other composers, the metrical feet can easily be traced, although as a rule the chronos protos does not form the basis of the notation as is the case with the Thus the fugue no. 16 of the fugues. 'Wohltemp. Klav.' is, after the first bar, constructed almost entirely of anapaests; no. 2 of anapaests and spondees, accompanied by the proceleusmatic form of the four time foot; no. 28 of the tribrachic form of the trochee, no. 18 of spondees and

dactyls. Aristoxenus' system of referring each kind of poetic foot to one of three species, iambic or three time, dactylic or four time and paeonic or five time, is of immense value in the analysis of modern music. Of the above-mentioned fugues, nos. 16, 2, and 18 belong to the dactylic species, and no. 28 to the iambic.

Greek musicians obeyed certain laws relating to the length of the colon, the use of the caesura, and the proportion of the weak to the strong portions of the foot, which are founded on a natural feeling for order and regularity in a work of art. Thus Aristoxenus tells us that they never allowed a colon of iambic rhythm to extend beyond the compass of six feet, a dactylic colon beyond five feet, a paeonic beyond three feet, for the ear cannot easily grasp larger time measurements than these. Hence a hexameter, which contains six dactylic feet must be divided into two cola by means of a caesura; and the caesura should be placed within a foot, rather than at the end, for by this means a more vigorous effect is produced.

Bach, Fugue No. 16:-



In this example, the semiquavers are chronoi protoi, the quavers chronoi disemoi, and the crotchets chronoi tetrasemoi. The subject of the fugue contains six feet in the dactylic species of rhythm: and Bach has produced the necessary caesura by means of the rest in the fourth foot.

When the art of the Greeks fell into

decay, their fine rhythmical forms as well as their melodies shared in the general ruin. Many of their technical terms were misunderstood, and have been to this day: and this has given rise to much misconception as to the nature of their music. Down to a recent period for instance the long syllable was believed to invariably be equal

The Roman musicians probably imitated the music of the declining period of Greek art; and about the beginning of the Christian era, the mixture of nations at Rome having caused the Latin language to lose whatever feeling for quantity it had possessed, poetry began to be written in which accent and not quantity formed the basis of the rhythm. A landmark in the ascendancy of accent over quantity can be fixed in the third century after Christ, when Commodianus, a convert to Christianity, wrote poetry of this kind, and distinctly asserted that he did so in order to please the vulgar, who had lost all the old feeling for quantity or time-measurement. One result of the disappearance of strict measure of time from poetry and music was the development of a form of music which followed the construction of prose words, taking its rhythm from the rhetorical construction of the text: and thus there arose on the ruins of the ancient measured music a new and magnificent art, now known as 'Plainsong' or 'Gregorian Music,' the rhythmical construction of which is based on the natural laws of phrasing explained by Aristoxenus, while the individual notes cannot be arranged in metrical feet and modern bars. Later on, towards the tenth century, certain poetical compositions called Sequences were sung in the Church. These consisted of verses containing a given number of accents, and connected by rhymes; but since strict time-measurement or metre did not enter into their construction, they were called Proses, and not

dignified with the name of poetry. To the invention of counterpoint, or music in parts, is due the rewakening of the feeling for metrical music; for it was impossible to sing vocal parts to prose music. But it took many centuries, and the gradual destruction of the fine prose rhythm of Plainsong to develope anew the old metrical rhythmical forms. The early modern composers in their gropings after a satisfactory mould in which to cast their instrumental compositions were gradually arriving at that natural balance and proportion of phrases and periods, anciently called rhythm, now known as 'form'; which, though not absolutely essential for vocal music, where the words, whether in prose or poetry, give the meaning, are imperatively required in instrumental music, if it is to arrive at anything higher than the dance forms. These efforts culminated in the magnificent structure raised by the genius of John Sebastian Bach, the founder of Modern Music: and when he had shown the way, the logical development of form was carried on by his great successors.

Modern composers have, by following the instincts of their genius, unconsciously brought about a renaissance of the natural rhythms and musical forms known to the ancient Greeks, simply enlarging and developing them by the aid of modern resources, while adhering to certain definite principles which on examination are found to agree with those enunciated 2000 years ago by Aristoxenus of Tarentum.

Many of the most powerful effects of music, both in ancient and modern times, have been produced by the use of vigorous forms of rhythm: and through Morelli's fortunate discovery at Venice the musical theorist is able to show why certain rhythms produce certain aesthetic effects, and to throw an important light on the construction of many modern masterpieces.

C. F. ABDY WILLIAMS.

1 I am leaving out of consideration the simple forms of rhythm used in the dance.



A Michigan Papyrus with Musical Notation Author(s): O. M. Pearl and R. P. Winnington-Ingram

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# A MICHIGAN PAPYRUS WITH MUSICAL NOTATION<sup>1</sup>

#### By O. M. PEARL AND R. P. WINNINGTON-INGRAM

P. Mich. Inv. 2958 18×30·3 cm. Second century A.D

THE papyrus was of good quality and the horizontal fibres on which the musical text was written offered a smooth surface. A narrow strip of lighter coloured material, as seen on the photograph (pl. XIX), runs across between the upper portion of the text (designated A) and the lower section (termed B); these sections are separated by a space of 2 centimetres. There is no difference in the texture, and there was no need to space the writing to avoid this area. The writing is a highly skilled and almost calligraphic hand, compatible with second-century book writing of not quite the best style, or with the more careful commercial hands of this period. The literary text, then, was probably written in the mid-second century; the accompanying musical signs were written by the same pen and hand.

The conjecture as to the date of the writing is supported by other evidence. A probability is suggested by the documents found with Inv. 2958. Thirty-seven of these have thus far been accurately dated; ten antedate A.D. 150, and twenty-seven fall between A.D. 155 and A.D. 216.2 Evidence more specifically related to the principal text is supplied by a fragmentary account on the verso of the papyrus. At the left side on the projection toward the top of the papyrus is a very much damaged portion of a list of names and payments, amounting to one or two hundred drachmae each. The list apparently began at the top of the sheet, perhaps with the damaged and illegible first line surviving (a total is accurately drawn for the amounts in ll. 2-7) and continued below the broken lower edge. Twenty-six lines or traces of lines survive. One item offers dubious prosopographical evidence as to date; line 16 reads Val() Val() (dr.) 100. In Tax Rolls from Karanis (P. Mich. IV), vol. 2, p. 195, a Valerius, bastard son of Valeria, is recorded as a taxpayer making payments between A.D. 171 and A.D. 175. The character of the writing would place the list in the late second or early third century, establishing this period as the terminus ante quem for the musical text. The papyrus was beyond doubt first put to use as a vehicle for the music on the recto, and later—perhaps twenty-five to fifty years later—utilized for the list.

<sup>&</sup>lt;sup>1</sup> This article is the product of collaboration between the authors, but O. M. Pearl is primarily responsible for palaeographical matters, R. P. Winnington-Ingram for the music. They acknowledge with gratitude the help which they have received from Professor and Mrs. Herbert Youtie and from Professor E. G. Turner.

<sup>&</sup>lt;sup>2</sup> The local number, indicating the specific area of this find, is 24-5006E<sup>2</sup>-A. Eighty-nine inventoried papyri were among the objects found here. See *P. Mich.* vi, 244 for a listing of twenty-seven papyri recorded under this local number.

```
The Greek Text
              ]. ago v[]\bar{z}.
1.
             ].. ω φιλτατε[]. κετω[
 2.
            ] a a g i g v z . [ ] a i
3.
        ]τ[ ]τιζει ποτη τινος νεο.[...]..
       ]. [ ] ½ ¾ ¼ ¼ ¼ ¼ ½ ½ [ ½
                                        ][
       ], T[.]. \eta tabeleye c no T[a \ Ta][...]..
       7.
     ]. γ η ε λας παν τη co .....ος ικ[....]
     1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
] N J V ' ) ~ a L U E Y / C . U a E Y
    ].... a φιλτα τε
10.
11.
     1 234 5 6789 10 H 12 13 14 15 16 ] a val j val j val j val j val a vi j [ ] a l
12.
     ]τωιca νώ[ ]ρθa[...]c φρacov φρα
13.
     14.
    ]ών εγενεθη σωτηρια τις νοστ.
15.
              \vec{a} \vec{a} \vec{b} \vec{c} 16.
      ] yης δευρο μοι εκ.[ ] φανει της
17.
     18.
     19.
     ] ài vọ và và vị aṣi a[]à.
                 6 7 8 9
                           10 11
20.
     ]... ουκές τα ελ πτου τερψις
21.
```

```
]... v v[
22.
23. ].[...] προς νυν
                                                                            1 23456 7 89 10 11 12 15 14 15 16 17 ]. . à nơa à gi . v.. g i . y
                                                  ] a λλο βαυ με τι εςπευβε προς ημα.[
 25.
                                                                                 26.
                                                                                ]. 1/ OUK avelbely Table maporta
                                                       ].[] i i<u>āg</u>
                                                                              ]. BOC EMMOEL
 29.
                                                                                      1 23 4 5 678 9
]. l<u>\(\xi\)</u> L L :\(\xi\) \(\phi\)
   30.
                                                                         ]. εων πεφαρμενων
                                                                                   1 2 3 45 6 7 8 9 10 11 12 13 14
]a a ! <u>al</u> o o o o v. . É v a
                                                                                 ]τον αιγισθουλ..εις τω..[]τα[]va
                                                                         ].[]a + \varticity \vartheta \varthe
   35. ]CK. a Tη ποιον φοβηθεις δειμα[
                                                                                                                                                                                      (Space of 2cm. blank)
                                                                                        ] o \( \frac{1}{2} \) \( \frac{1} \) \( \frac{1} \) \( \frac{1}{2} \) \( \frac{1}{2}
      3 6.
                                                                                         ] c_1 \omega \tau_1 = \tau_1 \nabla c_1 \cdot \sigma_1 \cdot \sigma_2 \cdot \sigma_1 \cdot \sigma_2 \cdot \sigma_2 \cdot \sigma_1 \cdot \sigma_2 \cdot \sigma_
                                                                                         ] c o o o §[
        38.
                                                       ]α γνωμην π...[
                                                                                      ] ¢ <del>R</del>. i [] ķi[
      40.
                                                                                    ]. νος 'ς αφώς το.[
```

```
42. ] φ ċ ċ ċ · [] · σ̄c[

43. ] ον πα ρος κ[·] · κονα[

44. ] · ο · ο · ο [ · ] · [

45. ] · ητον κακις τον · [

46. ] ο τ · ο ο φ ς · [

47. ] ρ ς ων ηλ θ ε ποι γη[

48. ] φ ċ ο φ [] φ ο φ ο [

49. ] ca ταν τα γαρ ο ρα[

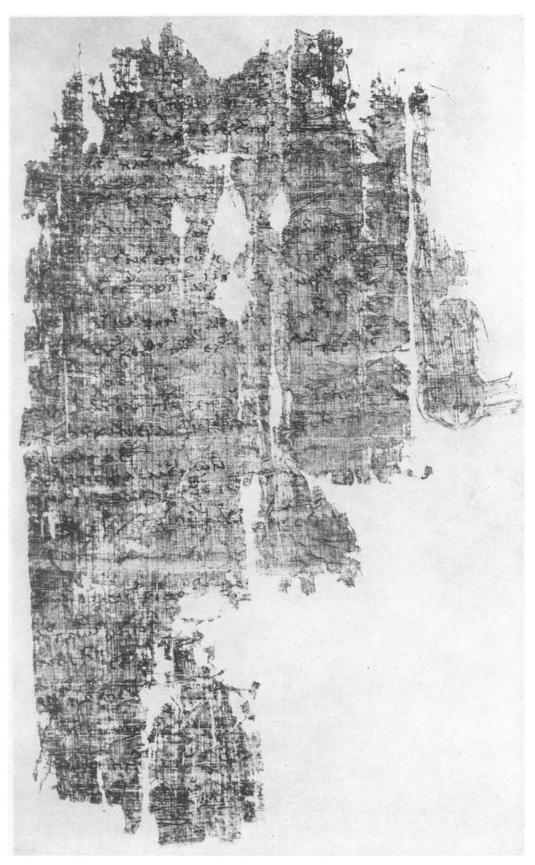
50. ] ἐ ἑ · [

51. ] · · · · [

(Papyrus breaks off)
```

# Palaeographic Notes

- L. 1. The line of notation is situated about 1 cm. below the top of the surviving papyrus. It was almost certainly the first line on this sheet.
- L. 2. []. $\kappa\epsilon$ : a possible reading is [] $\mu\kappa\epsilon$ , which may have stood in a phrase like  $\mu\eta\delta\epsilon\nu$ ,  $\hat{\omega}$   $\phi i\lambda\tau a\tau\epsilon$ , [ $\epsilon$ ] $i\kappa\epsilon$   $\tau\hat{\varphi}$  [ $\theta\nu\mu\hat{\varphi}$ . The desperate condition of the papyrus here even allows the possibility of  $\hat{\omega}$   $\phi i\lambda\tau a\tau$ ,  $\epsilon i\kappa\epsilon$   $\tau\hat{\varphi}$ [, since letter spacing is irregular; it is impossible to be sure that a letter stood in the lacuna in line 2, and note 7 in line 1 may be non-existent. The diseme over the note 1, 6 could be explained either thus or by lengthening of epsilon at the end of a kolon (cf. l. 11).
- L. 3, 8. The papyrus is rubbed above the note, which may have been a badly formed zeta, or even xi.
  - L. 3, 10. The surface is rubbed above the note, where a diseme or dot may have stood.
- L. 4.  $\pi o \tau \eta$ : the papyrus is badly damaged here, and theta is not ruled out.  $\tau i \epsilon \epsilon \hat{i} \pi o \tau$   $\hat{\eta} \tau i \nu o \epsilon \kappa \tau \lambda$ . would seem a plausible suggestion.
  - L. 5, 2-3. Very doubtful readings.
  - L. 5, 4. Carelessly written, but tolerably certain.
- L. 5, 11. The lower horizontal stroke is unusually long: perhaps a sign that the scribe had reached his margin.
  - Ll. 5 and 6. The indicated cancellations were effected with heavy horizontal strokes.
  - L. 6. ελεγες: between epsilon and sigma the papyrus is damaged; the space is slightly more than



PAPYRUS MICHIGAN Inv. 2958

is normal between the letters. Perhaps iota stood here; slight evidence for its presence is the fact that the bar of the epsilon is extended and is horizontal.

- L. 7, 9. Possibly a trace of a diseme stands over the trace of a note.
- L. 8. .occik: the traces before the doubtful omicron may be reconciled with mu or phi. The existence of text to the right of  $\iota_{\kappa}$  is a matter of probability without proof, but any letters written might well have been lost.
- L. 9. Where the signs are comparable, they seem to be in the same hand as the notes with the text. (For this line, see the discussion on p. 188.)
- Ll. 10 and 11. The alpha before  $\phi\iota\lambda\tau\alpha\tau\epsilon$  stands at a level which makes it uncertain whether it is a letter of the text or a note of the melody. It has, therefore, been assigned a note-number, tentatively.
  - L. 10, 2. The note was possibly iota; no suprascripts could have survived.
- L. 12. The irregular disposition (both horizontally and vertically) and the large number of the notes make it difficult to determine by position the exact relation each bears to the text.
  - L. 12, 3-4. Only a trace of the diseme remains; a dot may have stood over 4.
- L. 13.  $\nu \omega$ : the supposed omega may have been omicron, of the careless open type seen in  $-\tau ov$  of  $\alpha \epsilon \lambda n \tau ov$ , line 21. The surface of the papyrus seems fit to have retained some trace of the second loop of omega, yet none appears.
- L. 14, 1-3. The suprascripts are very doubtful. At 14, 3 xi (if correct) gives the interval of a tritone with the following note.
  - L. 14, 7. The surface which may have borne a diseme is lost.
- L. 15. After  $voc\tau$ , two possibilities, both resting on very faint traces of ink: a doubtful omega, a doubtful omicron-sigma. ?  $\pi \acute{o}\theta \epsilon \nu \ldots \acute{e}\gamma \acute{e}\nu \epsilon \theta$   $\acute{\eta}$   $\sigma \omega \tau \eta \rho \acute{a}$ ;  $\tau \acute{c}$   $\nu \acute{o}c\tau oc \ldots$ ; (The diseme at 14, 3 implies the scansion for  $voc\tau$ .)
- L. 16, 2. The suprascript bar seems plainly to have been made in two strokes: so also that of
- L. 16, 7-8. Although a hyphen would be appropriate, and the papyrus should have retained at least a trace of it, no ink remains.
- L. 17. Note the hiatus between  $\mu o \iota$  and  $\epsilon \kappa$ , which may be between kola. The number of letters missing between  $\epsilon \kappa$  and  $\phi a \nu \epsilon \iota \epsilon \gamma \epsilon$  cannot be accurately estimated.  $\epsilon \kappa \tau \hat{\eta} \epsilon$ ?  $\epsilon \kappa \hat{a} \epsilon \hat{c}$ ? The diseme at 16, 10 suggests that a long syllable has been lost. This, and the general metrical context, are against  $\epsilon \kappa \pi \rho o \phi a \nu \epsilon \hat{\iota} \epsilon \gamma \epsilon$ .
  - L. 18, 8, 9, 15-17. Suprascripts, if any were written, would have been lost.
- L. 19. ] $\lambda \eta c$ : perhaps chi instead of lambda, but there is no other chi in the text to serve for comparison. Eta can be read only on the assumption that the top of the vertical stroke has been lost, yet the surface of the papyrus appears to be intact.
- $\delta\iota$ [: above, between the lines and close to the preceding line of text, with a broken edge to the right, two boldly written letters, of which the second may be epsilon; possibly  $\delta\epsilon$ [.

For the repeated imperative we can compare, stylistically, line 13, where  $\phi \rho \acute{a} co\nu \phi \rho \acute{a} co\nu$  is plausible. But see also p. 186, n. 1.

- L. 20, 1-2. The two dots may well be portions of a single diseme.
- L. 20, 15-16. Between these notes the papyrus is broken. At the base of 15, alpha, there is ink resembling the extension of the slanted stroke which can be seen in 16, 15. Possibly iota stood in the lacuna.
- L. 20, 16. To the right, at a distance of  $3\frac{1}{2}$  mm., traces which might be of a vertical stroke, inclining slightly to the left at the top.
  - L. 21.]...: the second and third dots represent what could be epsilon-tau.
  - L. 22, 5. Possibly a diseme was drawn slightly to the right.

- L. 24, 4. Doubtful. If a leimma, it is unusually small.
- L. 24, 16-17. Very much damaged above: no suprascripts could have survived. Elsewhere in the line, traces of disemes, if they had been written, should appear.
- L. 25. Divide: ἄλλο δ'αὖ μ'ἔτι? The following hiatus is between kola? At the end of the line, the papyrus is badly rubbed; slight evidence of ink or stain three letter-spaces beyond the dot.
- L. 26. In the latter part of the line, though the papyrus is in good condition, there is no sign of the expected disemes (but the same is true in ll. 30, 32, and 34).
  - L. 27. τάδε or ταδί.
  - L. 28, 1. Possibly the initial stroke of an inverted omega.
  - L. 29. ]. $\beta$ oc: e.g.  $\theta \dot{\alpha} \mu \beta$ oc,  $\beta \lambda \dot{\alpha} \beta$ oc—a direct object is likely.
- L. 32, 7. The suprascript is carelessly drawn, in two strokes, with a kind of hook at the left, an upward pitch at the right.
  - L. 33.  $\lambda .. \epsilon \iota c$ : no room here for the larger letters.
  - L. 34, 9, 10. The papyrus above is rubbed.
  - L. 35. a τη: having blotted the alpha, the scribe leaves a small gap before tau?
  - Ll. 36 ff. Throughout Section B, the incidence of disemes is markedly sporadic.
  - L. 39.  $\pi$  . . . [: possibly  $\pi a \tau$ .[.
  - L. 40, 3. The ink traces may be of the top and right side of the note omicron.
  - L. 42, 2. The reading appears to be sound, but the note is placed unusually low.
  - L. 42, 6, 7. The diseme is doubtful.
  - L. 44, 3. The note may have been xi.
  - L. 44, 5. A subscript hyphen, with an illegible trace above it.
  - L. 46, 3, 4. The papyrus is rubbed above and below the notes.
  - L. 46, 7. The note is possibly xi.
- L. 47. The papyrus is broken between  $\eta\lambda$  and  $\theta\epsilon$ , but there is no reason to suppose that anything
- L. 48, 1, 2. Above the line midway between notes 1 and 2, and over alpha of the text, a curving stroke, perhaps intended as a dot associated with the note phi.

Note 2 may be omicron.

- L. 48, 4, 5. Between these notes the papyrus is broken. If the hyphen below note 5 is genuine, a note may be missing, since a hyphen would hardly be used to join identical notes. However, the hyphen may have been intended to belong to the whole group 3-5, all set to  $\tau av$ .
- L. 48, 7, 8. The notes are mutilated. Over 7, perhaps a dot, but the surface fibres are rubbed away, and if genuine, this ink must have stained through to the back fibres.
- L. 49. A large space stands between  $\tau a \nu$  and  $\tau a$ , within which the papyrus is broken, but there is no reason to suppose that any letter is lost. The large gap may be due to the fact that three (or more?) notes are given to \(\tau\alpha\). In the second syllable, the scribe botched his first attempt at alpha and rewrote it, drawing the bar of tau through the abortive first attempt.

#### Discussion of the text

The text or texts are unidentified. Between lines 34/35 and 36/37 there is a change of musical scale, but this need not mean that the texts are separate—unconnected or loosely connected. There is also a blank space on the papyrus at this point, equivalent to a line of text with notation, but we cannot be sure that this space was not utilized in the missing portion on the left (see below). If the texts were separate, this might be another example of a collection of extracts, as in the Berlin and Oslo musical papyri. For convenience of reference we call these Sections A and B.

In Section B few words are read with certainty and no coherent sense has been obtained at any point. There is more connected text in Section A. Here imperatives (ll. 13, 19), and vocatives (ll. 2, 11), the first personal pronoun (ll. 17, 25) and first and second personal forms of the verb (ll. 4, 6, 27), strongly suggest a dramatic text. There are requests for information (ll. 13, 19) and, probably, interrogative pronouns (ll. 4, ?6, ?15, 35). Drama may also be suggested by the occurrence—tantalizingly enough—of the name Aigisthos. There are references to safety, to a return (of Agamemnon?), to the unexpected, to the fears of a male person. Since the vocative  $\phi l \lambda \tau a \tau \epsilon$  (l. 2, if correctly interpreted) and the question  $\tau l \epsilon \epsilon l$  (l. 4) cannot be addressed to the same person, there is probably a change of speaker here: less probably, the same speaker is addressing two persons in succession. Changes of speaker may well occur elsewhere, but have not been identified with certainty.

The metre or metres are uncertain, but a strong iambo-trochaic tendency appears in those portions of Section A which can be read with plausibility: e.g. lines 4, 15, 21, 27, 31, 35. Some of these phrases have the ring of iambic trimeters (or possibly trochaic tetrameters), so that it is a hypothesis worth considering that some or all of Section A is written in a dialogue metre of drama. Lyric forms are not exemplified. Evidence is provided by the second Oslo piece (cf. Symb. Osl. 31, 27 f.) that iambic trimeters might be set to music in the Hellenistic period.

The right-hand margin of the column seems to be preserved. The ends of lines 3/4, 5/6, 7/8, 12/13, 14/15, 16/17, 18/19, 20/21, 24/25, 26/27 (probably 32/33, perhaps 34/35) roughly correspond; the papyrus to the right is badly rubbed in places, but some traces of writing would have been found, if it had in fact been used. The missing portions of the lines are thus to the left, and they may have been of considerable extent, since it seems to have been the practice to write musical texts in unusually broad columns (cf. E. G. Turner in Oxyrhynchus Papyri, xxv, 113). Four of our lines, however—11, 23, 29, 31—stop short of the right-hand margin. With the exception of 23 (προς νυν), the instances all end with a cretic, the metrical patterns being:  $- \circ - (\phi \iota \lambda \tau \alpha \tau \epsilon, 11); \circ - \circ -$ looks as though these may be the ends of iambic (or trochaic) kola: where two follow in succession, i.e. 29 and 31, we may have a clue to the length of line. It is at least not impossible that 31 contained a complete iambic trimeter (with seven elements missing) or trochaic tetrameter (with ten elements missing), the shorter kolon being on the whole more probable. On the assumption that some six or seven syllables are missing to the left, a good deal of the text of A, particularly towards the end, can be interpreted as iambic trimeters. The seductions of this hypothesis must, however, be treated

```
1 E.g. 31 \quad \times - - \times - - ] c \hat{\omega} \nu \pi \epsilon \phi a \epsilon \mu \dot{\epsilon} \nu \omega \nu
33 \quad \times - - \times - ] \tau o \nu A \dot{i} \gamma \dot{\epsilon} \delta o \upsilon \lambda .. \epsilon \iota c / x - - - 
35 \quad \times - - \times - ] \epsilon \kappa . a \tau \eta / \pi o \hat{\iota} o \nu \phi o \beta \eta \theta \epsilon \dot{\iota} \epsilon \delta \epsilon \hat{\iota} \mu a
35A \quad - \times - - - 
(There would be ample room for line 35A in the missing portion.)
```

with caution. It breaks down in 19 ( $\delta i\delta a\xi o\nu$ ), except on a supposition which is quite uncertain, and in 25, unless we assume a licence abnormal even in comedy ( $\xi c\pi \epsilon \nu \delta \epsilon \pi \rho \delta c \eta \mu a$ .). Hiatus in 17 and in 25 might be interlinear (in which case note the breach of Porson's Law in 17), but not in 27 (where, as in 35, we have the additional problem of the slanting line: v. infra).

It is of course possible that iambic trimeters (or trochaic tetrameters) were combined with other metres, e.g. dochmiac or cretic-paeonic. The rhythmical notation, if it were clear and consistent, should help to identify the metre or metres. As it is, the problems interlock: we need the metre to interpret the symbols, the symbols to interpret the metre. A further difficulty is that we do not know for what purpose the writer wrote or whether the text was continuous, though the consistency of the melodic scale suggests that it was. Still, there may be false starts and missing conclusions. In 23 writing ends in mid-line with  $\pi\rho\sigma\sigma\nu\nu\nu$ ! Further uncertainty is injected into the interpretation by the use in lines 26/27 and 34/35 of a diacritical mark unexampled in musical papyri.<sup>2</sup> A long upward-slanting line, boldly written, rises from the bottom level of the text to the top level of the notation. The following texts differ in their metrical shape: the line is followed in 26/27 by a trochaic, in 34/35 by an iambic movement. It can be neither asserted nor denied that in each case we have the opening of a metrical kolon or of a new speech (there is hiatus between the words on either side of the line in 26/27). The function of the lines may be to separate or to connect: if to separate, it could be that the writer has used this mark instead of beginning a fresh line (as, e.g., after 29 and 31).

As to the metre of Section B, it can merely be said that what can be read is consistent with an iambo-trochaic interpretation.

#### The Music

### (i) Melodic notation

As stated above, the musical notation was written by the same pen and hand as the text. The size of the notes and the care with which they were written vary considerably, as does the positioning of the notes in relation to the text. The Oslo and Oxyrhynchus (2436) musical papyri have texts written continuously without marked word-division, the notes being placed above the relative syllables, generally over the vowel. In the

There is no real objection to the repetition of  $\delta i \delta \alpha \xi \sigma \nu$ , stylistically or metrically (e.g.  $\circ - 1/\circ - \circ -$ ), nor to the apparent repetition of melody between 5-9 and 11-15. The notes repeat as follows:

It may be worth suggesting that perhaps the scribe made a false start, omitting the second iota; started again (making and correcting an error in the text), but failed to return and delete the first δίδαξον. The absence of rhythmical symbols in 5–9 could be accounted for by the state of the papyrus, but perhaps they were never written. However, no great confidence should be placed in this hypothesis.

<sup>2</sup> Professor Turner has called attention to the following instances of dashes within texts: Berlin Euripides, *Phaethon*—KKT v, 2, p. 79; Chariton—Oxy. Pap. VII, 1019; Euripides—N. Lewis, 'Greek Literary Papyri from the Strasbourg Collection', Ét. de pap. III, 52 ff. In these instances kola or sections are set off; in Oxy. Pap. III, 413, the dashes seem to serve a different purpose, perhaps cueing the action in the mime.

Berlin papyrus gaps are left after the vowels (and sometimes after the final consonant of a word); the notes are written above the gaps and not (with rare exceptions) above letters. In our papyrus there is a strong tendency to divide words and to place notes above the resultant gap (though it is not always so used). Internal division is less common, and it is sometimes between consonants. Examples: 16/17 ( $\phi a \nu \epsilon \iota c \eta c$ ), 20/21 ( $\epsilon c \tau a \epsilon \lambda \pi \tau o v$ ), 46/47 ( $\eta \lambda \theta \epsilon$ ), 48/49 ( $\tau a v \tau a$ ).

With the exception of line 9, the melodic notation raises no problems. There is a change of *tonos* after the gap between lines 35 and 36; and we therefore distinguish 1-35 (apart from 9) and 36-49 as Section A and Section B respectively. The extant notes, with conventional modern equivalents, are as follows.

The symbol v is a form of the note described by Alypius as w  $\tau \epsilon \tau \rho \acute{a} \gamma \omega vov$   $\mathring{v}\pi \tau \iota ov$ . It occurs in a rounded form in P. Berlin 6870; flatter and more carelessly written in P. Oxy. 2436. Here also it is rounded, and its true character is clearly seen at 18, 4, but the writing is often careless, almost angled at the lowest point (in 1. 20 notes 5, 8, and 10 show various degrees of care). This series of notes is proper to the Hyperionian tonos, which is employed also in the Berlin paean and in parts of Oslo A. The note  $\phi$  is read once only, but with certainty (30, 9). The notes of the scale which intervene between  $\phi$  and  $\xi$ , i.e. c (a) and o (b), are not instanced, but may be lost. The range of pitch corresponds to that of the Berlin paean, being slightly higher than that of Oslo A. The most striking melodic feature is the small compass within which the extant scraps of melody are seen to move. Since the musical phrases are incomplete and cadences cannot be identified with certainty, it is unprofitable to speculate about tonality.

Section B f g a b c' d' e'  
R 
$$\phi$$
 c o  $\xi$   $\iota$   $\zeta$ 

The symbol R ( $\beta \hat{\eta} \tau a \epsilon \lambda \lambda \epsilon \iota \pi \epsilon c$ ) occurs only at 40, 2, but seems certain. The form is closely similar to that of P. Oxy. 2436 (i, 2, 3 and 4, 1), Oslo B 17, 3; it is found with a somewhat different shape in the recently published Vienna fragments (cf. Wiener Studien, 75, p. 67 f.). This series of notes is proper to the Hypolydian tonos, which is employed also in the Second Delphic Hymn, the Oxyrhynchus Christian Hymn (P. Oxy. 1786) and Oslo B. The extant compass is less than an octave: the notes (not instanced) above and below are, respectively, E ( $f^1$ ) and f (e). Nothing can usefully be said about the melody, except to observe the preponderance of the three notes  $\phi \in O$ .

One point of substantial interest seems to be established. There is a sufficient number of cases in which both text and music are certain or highly probable to demonstrate that the melody—of both A and B—paid a high degree of regard to the word-accents.<sup>1</sup> In only one case  $(Ai\gamma ic\theta ov, 32/33)$ —and not all the notes are read with certainty—does an unaccented syllable carry a note higher than that of the accented syllable.<sup>2</sup> The instances can be studied conveniently in the transcription into staff

<sup>&</sup>lt;sup>1</sup> The evidence of earlier musical documents is examined in Symb. Osl. 31, 64-73. See also Oxy. Pap. xxv, 116 f.

<sup>2</sup> Moreover, Αἴγιεθ' οὐ (or οὖ) is a possible division.

notation, but the following may be cited here: 5, 4-7 (τάδ'ἔλεγες or τάδε λέγεις); 12, 15-16; 16, 12-16; 20, 8-14; 30, 4-9; 34, 4-6; 38, 2-3; 46, 3-5. There are several cases in which a circumflex-accented syllable seems to be set to a falling pair of notes: 24, 5-6 (?); 28, 4-5; 30, 2-3 (?); 40, 5-6 (?); 46, 3-4. On the other hand, the subordination of grave accents to the following acute or circumflex (as in the Delphic Hymns) is not always found: cf. 26, 3. This seems to have been the first feature of the accentual system to break down. Our pieces thus fall with the Berlin paean and P. Oxy. 2436 rather than with the Delphic Hymns; observance of the accents is slightly stricter than in the two Oslo pieces. Unfortunately, it is only the Delphic Hymns that can be dated (c. 130 B.C.).<sup>1</sup>

It is worth bearing this practice in mind in interpreting the text. Thus, in line 4,  $\tau i \nu o c$  is more probable than  $\tau \iota \nu o c$ ; in line 35, we should hesitate to read e.g.  $\langle \kappa \rangle \rho \acute{\alpha} \tau \eta$ . In line 6, the notes suit  $\check{\epsilon} \lambda \epsilon \gamma \epsilon c$  (or  $\lambda \acute{\epsilon} \gamma \epsilon \iota c$ ) but not  $\check{\epsilon} \lambda \epsilon \gamma \acute{\epsilon} c$   $\pi o \tau$ .

The series of note-forms in line 9 constitutes a special problem. That they are musical notes is certain; and there is some probability that they were written by the same hand as the notation associated with the text. In what relation, if any, do they stand to the surrounding context? The fragmentary texts of lines 8 and 11 do not help in determining this, since it is not clear whether there was a natural break which might, for instance, have given occasion for unaccompanied melody. Line 9 may not indeed have formed part of the original plan. The distance between 7/8 and 10/11 is not in fact greater than that between 16/17 and 18/19. The notes may have been written there, because there was space, rather than space left for the notes. They are lightly, and perhaps quickly, written.

The notes may or may not be melody: if not melody, they might be a scale or just writing-practice (less likely). The fact that (with the exception of a slanting line at the end) there are no suprascript symbols does not rule out melody. But the main problem is to identify the notes and the system of notation to which they belong. The Greeks had two systems of notation, generally distinguished as 'vocal' and 'instrumental'. The vocal notation is used for the settings of words in all our documents, with one exception. The instrumental notation is used for the Second Delphic Hymn and for the pieces without words on the Berlin papyrus (and probably for notes of accompaniment in the text line of the Orestes papyrus). If line 9 represented an instrumental interlude, one might have expected, though one could not demand, the instrumental notation.

To which notation do the notes of line 9 belong? Perhaps the most striking fact is that, of the notes which can be clearly read, the majority seem to belong to the vocal notation and to the tonos employed in A: cf. 3, 7, 8, 10, 14 (not exemplified in the noted text). In addition, 2 may be  $\Theta$ , 9  $\zeta$ , 19  $\Gamma$ . But 14 is also a symbol belonging to the instrumental notation, to which we should naturally ascribe 5–6 and 12–13. The combination of notes from both notations might occur in the writing of a scale, but we have been unable to identify the series as such.

<sup>&</sup>lt;sup>1</sup> Cf. Oxy. Pap. XXV, 117.

<sup>&</sup>lt;sup>2</sup> The vocative in line 11 might, but need not, have occurred towards the beginning of a speech.

# (ii) Rhythmical notation

The papyrus probably exemplifies all the five symbols known to us from other musical documents: the diseme line, the stigme or arsis-dot, the hyphen, the leimma, all seem to be certain, and there may be an instance or instances of the double-point or colon.<sup>1</sup>

(a) Hyphen. Where more than one note is given to a syllable, we find a subscript hyphen in some 17 or 18 cases. (The state of affairs is sometimes rather obscure, e.g. at 32, 13; 44, 5; 48, 5.) In a smaller number of cases no hyphen can be read, but the condition of the papyrus is often bad and some hyphens may be lost. There are, however, instances in which, if a hyphen had been written, it could probably still have been read (e.g. 16, 7-8). It is hard to say whether the absence of hyphens has significance, rhythmical or melodic, or is due to carelessness.

There is one clear case in which three notes are given to a syllable: 20, 12-14. The hyphen covers the last two notes only, but may have been intended to cover all three, representing a triplet rhythm.<sup>2</sup> In a similar group of three, at 12, 2-4 (where the text is obscure), the hyphen covers the first two notes. (See also the comment above on 48, 4-5.) Two notes, with a hyphen, are found over a short syllable at 16, 3-4 and 20, 8-9; without a hyphen, at 30, 7-8 (see below). This implies a halving of the basic time-unit; and there is a parallel to this in line 3 of the Oxyrhynchus Hymn (over the first syllable of  $\chi a \gamma \iota \nu \nu$ , which is scanned short). There are also two rather dubious instances in the Oslo papyrus (4, 8–9 and 14, 12–13).

- (b) Double-point. There is no absolutely certain occurrence of this symbol in our papyrus. At 7, 6 the upper dot is not immediately above the lower, which may be the trace of a note. 30, 6, however, is a probable instance. The function of the symbol in our musical texts is obscure (cf. Symb. Osl. 31, 85-87). On the whole it would seem to have been used in order to clarify the relation between notes and text; and, from this point of view, there would be a good reason for its employment in line 30. The composer has set the third syllable of  $\pi\epsilon\phi ac\mu\dot{\epsilon}\nu\omega\nu$  to two notes (v. supra), despite the fact that it is short; the preceding long syllable carries only one note; he wishes to ensure that this unusual distribution is observed, and so employs the double-point. No hyphen is read under 30, 7-8. This may not be significant, but one must refer to the observation of R. Wagner (Phil. 79, 207) that, in the Berlin paean and the Christian Hymn, a double-point is found preceding a group of notes belonging to a single syllable and not linked with a hyphen (cf. Oxy. Pap. xxv, 117). One must ask why the double-point and not the hyphen was used in this case.
- (c) Leimma. This symbol occurs in the form o, as in the Berlin papyrus and the Oxyrhynchus Hymn: contrast the careless form, approximating to a straight line, of Oslo A and the angled lambda of the MS. hymns and P. Oxy. 2436. There are several occurrences, not all certain, in Section A, none in Section B. Elsewhere the leimma serves more than one function (cf. Symb. Osl. 31, 81-84; Oxy. Pap. xxv, 118). (a) In Oslo A and the Oxyrhynchus Hymn it is found at the end of catalectic anapaestic

<sup>&</sup>lt;sup>1</sup> The evidence of earlier documents is examined in Symb. Osl. 31, 73-87; Oxy. Pap. xxv, 117-19. A few rhythmical symbols are found in the Vienna fragment (c): cf. Wiener Studien, 75, p. 59.

2 It is also possible that the group should be rhythmized (cf. Oxy. Pap. xxv, 117, n. 4).

kola, representing a pause or prolongation. (b) In P. Oxy. 2436 it represents a prolongation of the preceding note over a long syllable which appears to have the value of three time-units: the metre is apparently iambic with 'suppressed' short syllables. A similar function is seen, in a logacedic metre, in the Hymns of Mesomedes. (c) In the Berlin paean and Ajax fragment also, the leimma seems to have the function of protracting the preceding note. In the paean it always occurs at the end of a phrase, but sometimes precedes the final note; in the Ajax fragment two cases out of three are within the phrase. It might be expected that in any given piece the leimma would have a single consistent function. Our instances are as follows:

- 1, 4; 5, 3. Neither certain, the latter very doubtful. Both follow a note (or notes) associated with a long syllable (doubtful in 1) and are followed by a text of cretic-paeonic shape.  $\frac{\cos \phi}{\cos \phi} = -\frac{\cos \phi}{\cos \phi} =$
- 7, 3. A cretic rhythm is possible here also, but is given no support by the following word and notes. The text could also be interpreted as the end of one trimeter and the beginning of another. The employment of a leimma at such a point would be a new phenomenon (but see below).
- 18, 3. The suppression of a short syllable at this point is not out of the question, but the rhythmical interpretation of the context is problematical (see p. 186, n. 1). In this case alone the leimma, which always has a dot, carries a diseme also.
- 20, 4. Follows a long syllable; precedes what appears to be the beginning of a trimeter.
- 24, 4. The relation of notes to text is uncertain, but here at least there could be no question of a break between kola. The reading is, however, very dubious.
- (d) Disemes. In all cases where the text is read, these occur over long syllables. Where one note only is given to the syllable, the diseme is placed directly above the note or slightly to the right. Where two notes are given, the position varies: sometimes the diseme covers both notes (e.g. 20, 10–11), sometimes the first only (e.g. 28, 4–5), sometimes the second only (e.g. 14, 9–10). There are also cases of three notes to the syllable: e.g. 12, 2–4 (where the diseme covers the second and third, the hyphen is below the first and second), 20, 12–14 (where the diseme is over the second note only, the hyphen below the second and third).

Clearly disemes relate to the syllable and not to the note. Not every long syllable, however, by any means carries a diseme. Where a diseme is absent, there are three possible explanations. (a) The physical disappearance of the diseme, in a broken or rubbed piece of papyrus: and this is doubtless the correct explanation in some cases. (b) Accidental omission (through carelessness in copying?). Suprascript symbols seem notably absent in some portions of the papyrus: e.g. 24/25, 26/27, 30/31. (c) Deliberate omission. It may be remarked that, in the Oslo papyrus, the employment of disemes is regular in A, but selective in B, on a principle which has not been established. If we could reach a proper understanding of the metre and rhythm, we could no doubt assign each case where (a) does not operate to either (b) or (c).

A question of some importance is whether the symbol is ever to be read in the form

of  $\neg$ , i.e. as a triseme. This is exemplified in the Seikilos inscription; and it would appear there to be used for the same purpose for which the leimma is used in some other pieces, i.e. to indicate that a note is prolonged to the length of three time-units (because of the 'suppression' of a short syllable or otherwise). It is possible, though not certain, that the leimma is so used in our papyrus; it is probable, though not certain, that both notational conventions would not be used in the same piece. The writing of dots and disemes is here so careless<sup>2</sup> (and the condition of the papyrus often so bad) that we should not lightly assume that a triseme was intended. A form approximating to  $\square$  is indeed seen at 10, 5; 20, 3 and 13; 40, 2; and possibly also at 18, 2 and 42, 3. In few of these cases is there an inherent likelihood of a triseme: it is much more probable that the writer has amalgamated diseme and dot into a single stroke. 20, 10 is remarkable, in that there seems to be a dot in addition to an upward prolongation of the diseme. But could a triseme stand over two notes joined by a hyphen? At 32, 7 the diseme ends with an upward-slanting line; at 28, 4-5, in addition to the diseme and dot over 4 (or 4 and 5), there seems to be a slanting line upward from the top edge of 5. In both cases the end of a trimeter is to be suspected; and it may, therefore, be worth observing that in Oslo B (at 16, 9; 17, 2; 18, 7—in all three cases at the end of an iambic trimeter) the diseme has a curious upward prolongation.

(e) Dots. Our one theoretical pronouncement (Anon. Bell. §§ 3/85) tells us that the criyµ $\acute{\eta}$  was used to mark the arsis. It is so used, strictly and consistently, in the Christian Hymn³ and in Oslo A in the case of an anapaestic metre; in the Berlin paean, to give a dactylic/anapaestic rhythmization to a text in long syllables; in Seikilos, in the case of an iambo-choriambic metre. The employment of the dot in the Berlin Ajax fragment and in the Orestes papyrus (dochmiacs)⁴ is less clear (cf. Symb. Osl. 31, 77 ff.). Dots are rare in Oslo B (iambic trimeters?) and in P. Oxy. 2436, except in ii, 6-8, where they are used in association with a cretic text (? iambic metra with suppressed short syllables). The problem in our papyrus is a superfluity (in many parts) rather than a scarcity of these symbols. Since, in our other evidence, they tend on the whole to be carefully and intelligibly used, there is some probability that here they have on occasion been misread or miswritten, and that some cases may even be blots from a careless pen. We can discern no consistent and intelligible pattern which might help us in the interpretation of the metre. We add, however, a number of observations in the hope that they may help other students towards a solution of these problems.

If the dots read over 7, 2-7 (including probably 6) and over 16, 2-8 are all genuine, then, even allowing for possible breaks between kola and for our ignorance of the function of the leimma, we might as well give up the attempt to interpret them in

<sup>&</sup>lt;sup>1</sup> It is found once in the Vienna fragments, in line 2 of fragment (c).

<sup>&</sup>lt;sup>2</sup> In two cases, at 16, 2 and 18, 12-13, the diseme is clearly written with two strokes, meeting in a kind of peak. This seems to have no bearing on the question of trisemes.

<sup>&</sup>lt;sup>3</sup> With this qualification, that in the later portion of the piece the practice is reversed, the dots appearing, but still consistently, over the thesis-syllables (cf. Symb. Osl. 31, 81).

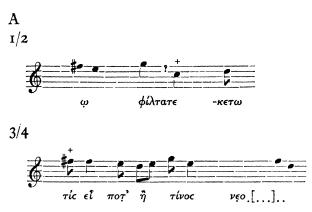
<sup>\*</sup> The scheme would appear to be:  $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$   $\frac{1}{2}$  Dots are also found over the squarely written zeta (? an instrumental note) which occurs between dochmii in the line of text. The Orestes papyrus has been re-edited by H. Hunger and E. Pöhlmann in *Wiener Studien*, 75, pp. 76–78.

the light of our other evidence. On a lesser scale, the same might perhaps be said of 10, 3-5 (which might well be a test case). The diseme at 5 indicates that the last syllable of  $\phi i \lambda \tau a \tau \epsilon$  is lengthened (and the written text ends at this point). The cretic lexis might then be: a cretic as such, the end of an iambic metron ( $\alpha$ ?  $\phi i \lambda \tau a \tau \epsilon$ ), an iambic metron with suppressed short syllable, a catalectic trochaic metron (though more complex metres are not ruled out). The dot over 4 is quite certain. It seems improbable that there was a dot as well as a diseme over both 3 and 5. It is possible (to revert to an earlier suggestion) that one or the other was a triseme (or intended as such). If the former, we should have a syncopated iambic metron, the second half of which is treated as arsis; if the latter, a syncopated (or catalectic) trochaic metron, in which the first half is treated as arsis.

Lines 3/4 are relatively intelligible. The metre is apparently iambo-trochaic (without syncopation). The presence and absence of dots are fairly clear between 2 and 7. If we could assume that note 1 has lost a dot, we have a series:  $\dot{c} = c - c = c - c = c - c$ , implying (on the iambic hypothesis) metra of the form c = c = c - c = c - c = c - c.

16, 2-5 may be comparable with 10, 3-5. The dots over 3 and 4 (two notes set to a short syllable) are certain. It is improbable that both 2 and 5 were intended to carry dots, but that over 2 (unless a blot) seems certain. Perhaps 5 has a triseme? (The following leimma, with diseme and dot, is surprising. One may hazard the suggestion that the writer sometimes placed a leimma at a sentence break or change of speakers, with or without diseme, to mark a pause and that such a leimma was not necessarily integrated with the rhythmical scheme. This might explain the fact, if it is a fact, that leimmata are found in addition to trisemes.)

The following transcription of the melodies into modern staff notation should enable the relationship between melody and word-accent to be studied with greater ease; it also displays the narrow range of the melodies, but no less their floridity in certain passages. Since it is intended to be studied in close relation to the palaeographical transcription, some simplification has been introduced and conjectural word-divisions and accentuation admitted. Where time-values are quite uncertain, notes have been printed without 'tails'. The mark + above a note indicates that it is doubtfully read. The mark ? has been used to indicate, where this seemed useful, that a note is missing.





τέρψις

 $\dot{a}$ έλ $\pi$ του

οὐκ

# O. M. PEARL AND R. P. WINNINGTON-INGRAM

22/23



24/25



26/27



28/29



30/31



32/33



34/35



















A New Fragment of Greek Music in Cairo Author(s): J. F. Mountford

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## A NEW FRAGMENT OF GREEK MUSIC IN CAIRO<sup>1</sup>

# [PLATE V.]

The papyrus numbered 59533 in the Catalogue Général of the Cairo Museum is a mere scrap (13 cm. × 12 cm.), on one side of which is written a fragmentary text with suprascript musical signs:

ON TO NA TWN EΠΙ ΚΑΤΑCΠΟ[

I Π Τ Υ ΛΜ Ο Ι Κ

I ΓΟ ΝΑ ΤWN EΠΙ ΚΑΤΑCΠΟ[

N

]

A Π Λ Μ Υ Π Μ Υ Μ

]

A Π Λ Μ Υ Π Μ Υ Μ

The writing is along the fibres, that is to say, on the recto if the scrap originally formed part of a roll; the verso is blank; and the papyrus has been folded horizontally. The right-hand and the top seem to be the original edges of a sheet or roll; the left-hand is clearly defective, and though the bottom edge may be the original edge of a sheet, it is not the bottom of a roll. The writing is carried to the extreme right-hand edge, without a margin. Below the text there is some scribbling which seems to have no particular significance and is probably to be taken as a probatio pennae rather than as a signature. The musical signs are written either directly over the vowels or spread over a vowel and the preceding consonant, except in the second line, where the sign T is placed over an N instead of over the succeeding A, and in the third line, where the musical sign appears over the final consonant. The various scratches and dots which are to be seen on the photographic facsimile (see Plate V) are not ink, but defects of the papyrus; every ink mark which can be read is included in the transcription given above.

Provenance and Date.—The scrap was acquired by the Museum along with a number of Zenon papyri, and is presumed to have come from the

<sup>&</sup>lt;sup>1</sup> This article owes much to Mr. C. C. Edgar, formerly Director of the Museum at Cairo. He not only brought the papyrus to my notice and obtained permission for its publication, but he has also placed his wide knowledge of papyri unreservedly at my disposal. Thanks to his kind offices, many details

of the papyrus were carefully examined in Cairo by the present Assistant Keeper, Mr. Battiscombe Gunn, and by Professor W. Schubart. Principal Stuart Jones and Mr. J. U. Powell have also given me the benefit of their criticisms and suggestions.

same find. This prima facie evidence of origin is in favour of a date about 250 B.C. According to the opinion of Mr. Edgar, the general character of the script and the form of the individual letters also tend to confirm this The fragment consequently assumes a special interest as the oldest Greek musical document extant: for the Delphic Hymns were inscribed in the later half of the second century B.C.2; no earlier date than the second century B.C. has been suggested for the Aidin epitaph of Sicilus (Σείκιλος) 3; the Rainer papyrus which contains a fragment of the Orestes of Euripides is judged by Wessely to belong to the time of Augustus 4; the Berlin fragments are copied on the verso of a Latin military document of 156 A.D.; the Christian Hymn from Oxyrhynchus is on a papyrus dated in the third century A.D.; and the Hymns attributed to Mesomedes are preserved only in mediaeval MSS. from the twelfth century onwards. Nor is the date of the mere document the only matter of importance. So far as the date of the composition of the music is concerned, our new fragment is probably junior to the Orestes piece alone: in the case of the Delphic Hymns and the Aidin epitaph there is no reason to distinguish between the date of composition and the date of inscription; the Berlin fragments and the Christian Hymn, even though they may be much older than the documents which preserve them, present no evidence of having been composed as early as the third century B.C.; and the hymns of 'Mesomedes' are almost certainly the work of Imperial Rome. Both the age of the papyrus and the comparatively early date of the piece of music written on it are such that we might reasonably expect new and valuable light to be thrown on some of the problems of the Greek musical system.

Since papyrus rolls in Zenon's time were more than thirty centimetres high and our scrap is only thirteen, either a great deal is missing at the bottom or the scribe has used an odd strip of papyrus; such a strip may of course have been cut from a roll. The suggestion that our scrap was a casual sheet of papyrus and no longer part of a roll at the time when the text and music were written is confirmed to some extent by the fact that no care has been taken to leave a margin at the right-hand edge and by the scribblings below. It is unwise therefore to assume that the text was written in columns; the complete document may have been merely two and a half rather long lines. We may perhaps have here a famous passage copied out by some citharode or music student or dilettante for his own purposes; or perhaps this is a draft of some new song in the handwriting of the composer. In any case, the fragment was presumably filed among the Zenon papyri by some mistake; unless, indeed, this piece of music is

<sup>&</sup>lt;sup>2</sup> For the evidence, see New Chapters in Greek Literature (Second Series), pp. 149-50.

<sup>&</sup>lt;sup>3</sup> Sir W. M. Ramsay, who discovered the inscription, writes in a letter: 'As to date, the form of letters offers no evidence. It might be of almost any time after the second century B.C. was at end; the terminus ante quem cannot be stated. It was not done in a period of universal deterioration except by some very distinct personality, standing apart and alone. . . . As you say, the date first century A.D. is a mere guess;

there is no reason why the stone should not be of that date, and no reason why it should not be 60 B.C. or 150 A.D. or later. There is something about the spirit of this epitaph that smacks of the first century in Rome, but such a person as Seikilos is quite elusive, and apart from his time and surroundings.'

<sup>&</sup>lt;sup>4</sup> See K. Wessely, *Mitteil. aus der Samml. der Papyrus Erzherzog Rainer*, Vol. V (1892), p. 67: Die prächtige Schrift des Orestfragment erlaubt gewiss es in die Zeit des Augustus zu setzen.

in some way connected with Heracleotes the harper, who in two other papyri appeals to Zenon for the restitution of his instrument.<sup>5</sup>

Text and Authorship.—I have not been able to trace the fragments of text in extant Greek literature; and complete ignorance of the original length of the lines makes reconstruction hazardous.

Line I. The words  $\tau d\delta \epsilon$   $\tau d\delta \rho$   $\delta \nu$  ikétiv seem to be tolerably certain, and ikétiv in particular affords a clue to the general nature of the context; for the mention of supplication immediately suggests that we are dealing with a fragment from some tragedy. It would, of course, be possible to divide the letters as  $\tau d\delta$   $\dot{\epsilon} \tau d\rho \omega \nu$ ; but on such a basis I can think of no supplement which, without  $\tau \tilde{\omega} \nu$  or  $\dot{\epsilon} \mu \tilde{\omega} \nu$ , would be good Greek, and there is no possibility of introducing any such word here in a position which would be normal. Furthermore, the form  $\dot{\epsilon} \tau \alpha \rho o \rho s$  seems not to be used in tragedy except once by Aeschylus (*Pers.* 989).

At the beginning of the line,  $\sigma o i$  is open to several interpretations. (a) It may be the dative of  $\sigma \dot{v}$ ; but in this context I doubt whether it could depend on such a verb as  $\varphi \rho \dot{\alpha} g \omega$  or  $\varepsilon I \pi o \nu$  without some suspicion of tautology.

(b) A future optative is very unlikely indeed, but either an aorist like πέσοι or a present like πράσσοι would probably make good sense. (c) Perhaps we may have the last syllable of an adjective, as ⟨πόνοι δισ⟩σοί, or of a noun, as ⟨φρενῶν νό⟩σοι, which formed the culmination of a catalogue of grievances or woe.

At the end of the line, αυ- is shown by the musical notation to be a diphthong, and αὐδάν seems a likely conjecture.

Line 2. γονάτων ἔπι admits of no doubt, and κατασπο- points with all probability to some part of κατασποδέω. A division of the letters into κατ' ἀσπο- is not likely to afford any improvement.

At the beginning of the line the only fact which is really definite is that we have traces of a letter which consisted of, or ended with, a vertical stroke.<sup>6</sup>

Line 3. No certain restoration is possible here.

<sup>&</sup>lt;sup>5</sup> For Heracleotes see H. I. Bell, 'A Musical Competition in the 3rd Cent. B.C.', in *Raccolta di Scritti in onore di Giacomo Lumbroso* (1925), pp. 13-22.

<sup>&</sup>lt;sup>6</sup> Professor Schubart writes: Die Spuren deuten auf θ̄] (darüber Rest eines Bst., vielleicht Δ), ỴṆ (σ]υνγονα) ist zur Not möglich.

to the author's prosodical canons. But, even though τάρ is a combination of particles better suited to dialogue than to a lyric, one hesitates before allowing so many metrical liberties and irrational feet to a Greek poet. Dactyls and anapaests are precluded in each line by the three successive shorts embedded between two longs. Paeonics would be possible if we could read τάδ' ἐτάρων in the first line; the suggested αὐδάν would not need revision; and in the second line, as Principal Stuart Iones suggests, κατασποδηθεῖσα would be an easy supplement. The dochmius is a Proteus among metres and it is just possible that a little manipulation would reveal a dochmiac element in these lines.8 Another solution, and one which avoids the difficult ετάρων, is to class these lines with the metres which a changing fashion calls logaoedic or Aeolic. The ordinary forms of the Glyconic or Pherecratean are obviously impossible; but the metrical data of our fragment are fully satisfied by the application of the following colon: - - - - - Though such lines are not among the most common in Greek tragedy, Euripides nevertheless frequently introduces them in twos and threes among other lines of a Glyconic type, and sometimes uses them in sequences, as in Iphig. in Aul. 546-553.

It is impossible to ascribe this tragic fragment to any particular author. The word ikétis, it is true, appears only twice in the seven plays of Aeschylus and only once in the seven plays of Sophocles, whereas it is found eleven times in the nineteen plays of Euripides. If we make allowance for the greater bulk of work extant, Euripides is either more fond of this word or finds more opportunities for using it than the other two tragic writers; but on such a slender foundation no sort of conclusion can be based.9

The Musical Notation.—Since there are no metrical signs, our only concern is with the interpretation of the signs for pitch. It is not possible to equate a Greek musical sign immediately with a note in our modern notation; for within certain limits the interpretation of the Greek signs depends upon the key (τόνος) which the composer used, and upon the subtler distinctions of the genus, whether enharmonic, chromatic, or diatonic, in which the melody is set. A late writer, Alypius, has preserved tables of the notation of the various Greek τόνοι in all three genera. For most of the

This might be translated as:... he would act unjustly. These then (are) the things for which in supplica-

parallel of Euripides (with catalexis in the fourth line), may indicate the sort of context from which the fragment came:

tion I raise my voice . . . whom I address in prayer, as I am forced to my knees in the dust.

<sup>7</sup> If ἐτάρων and its rhythmical implications were accepted, we should note the curious coincidence that all the musical fragments—this new one and the Delphic Hymns—which have no metrical symbols in their notations would be paeonic.

<sup>&</sup>lt;sup>9</sup> Our fragment is too mutilated for any restoration to be proposed with confidence. However, the following reconstruction, based on the rhythmical

extant fragments of Greek music these tables have proved a very satisfactory clue, and to them we naturally turn for the elucidation of this new The notes which can be read distinctly on the papyrus are ΛΠΜΥΤΥΟΙΚ 10; but among the tables of Alypius there is no single τόνος which includes all these signs and we must adopt a somewhat circuitous route before we can arrive at a solution of the problem. Of the definite signs, M occurs four times, A and II occur three times each, and Y occurs twice; these surely must form the starting point of any sound musical interpretation of the fragment. The only Tovol which contain all four of these signs are the Phrygian, the Hyperphrygian, and the Hypo-The other notes TYOIK occur once each; but the sequence OIK at the end of the second line raises a number of special problems and must be put aside for a time. The signs T and Y both occur in the Phrygian and the Hyperphrygian; but T alone is in the Hypodorian and this τόνος can therefore be eliminated from our discussions. In the three genera the six notes we have mentioned have the following approximate values in ascending order of pitch: 11

	Υ	T	П	Μ	٨	¥
enharmonic	$\mathbf{G}\times$	Ab		$\mathbf{C}$	$\mathbf{C}  imes$	ab
chromatic	Ab	Bbb		$\mathbf{C}$	$\mathrm{D}\flat$	bbb
diatonic	Ab		$\mathbf{B}\flat$	$\mathbf{C}$	$\mathrm{D}\flat$	(ab)

It will be seen at once that no single genus contains all these notes, and we must agree that the fragment presents a mixture of genera. The musical theorists do not tell us much about the mixtures of genera; but the important chapter in Ptolemy's Harmonica (II. 15) with its accompanying tables seems to envisage scales in which an octave consists of two disjunct tetrachords of different genera and each tetrachord contains three intervals only. mixture, however, which appears in this fragment is not of that nature; for within the Perfect Fourth  $\gamma$  to  $\Lambda$  there are four intervals and the mixture of genera is intratetrachordal. In the chromatic sections of the first of the Delphic Hymns, however, there is a very close parallel to this melodic feature of the new fragment; and it is interesting to find now another example of a sequence of semitones within a tetrachord which is in violation of the melodic principles laid down in the works of Aristoxenus.<sup>12</sup> But what is the exact mingling of genera adopted in this fragment? Is it a mixture of enharmonic with diatonic, or of chromatic with diatonic? notation alone will not help us, since enharmonic and chromatic notes within the same tovos have the same musical sign. From the remarks of Aristoxenus 13 it is clear that in the later half of the fourth century the enharmonic was falling into disuse in favour of the sweeter chromatic; it is unlikely, therefore, that we have an admixture of the enharmonic unless this fragment is the work of a composer of the fourth century. An inter-

<sup>&</sup>lt;sup>10</sup> The sign T in the second line was examined by Professor Schubart, who agreed to the reading, but added the note: auch v möglich.

 $<sup>^{11}</sup>$  The sign imes is conventionally used to indicate

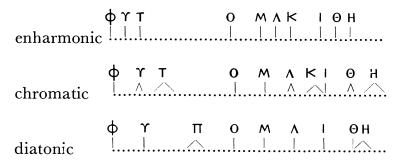
the raising of a note by a quarter of a tone.  $\forall$  is not a diatonic note in the Phrygian.

<sup>&</sup>lt;sup>12</sup> Harm. p. 63 M.

<sup>&</sup>lt;sup>13</sup> Harm. p. 23 M.

pretation on the basis of the enharmonic is only practicable if we restrict the diatonic genus to the note  $\Pi$ ; certainly it would be absurd to take  $\Upsilon$  as diatonic since it is identical in pitch with enharmonic T, and such a complication in notation is highly improbable. Regarding  $\Pi$  then as the only distinctively diatonic note, we find that the melodic sequence of the first line, if we take a whole tone as the unit, is:  $I\frac{1}{4}$   $I\frac{1}{4}$ 

If we are to investigate the possible mixtures of chromatic and diatonic genera we must first distinguish between the various subdivisions  $(\chi\rho\delta\alpha)$  of the chromatic and diatonic. In a chromatic  $\tau\delta\nu$ 05 the constituent tetrachords, bounded by fixed notes  $(\varphi\theta\delta\gamma\gamma0)$   $\delta\tau\tilde{\omega}\tau$ 5), were so divided that the two smaller intervals were not less than a third of a tone each, nor more than a semitone each, while the remaining interval completed the Perfect Fourth. In a diatonic scale the smallest interval of the tetrachord was a semitone and the other two varied between three quarters of a tone and a tone and a quarter. Now of the notes we are discussing, only M in the Phrygian and the Hyperphrygian is fixed. How the others varied may be seen from the following diagram, in which I have included another fixed note  $\varphi$  and certain others which will enter later into our discussion: 15



If we take as chromatic every note which can conceivably be so interpreted, we shall be compelled to dismiss any collocation of *genera* which makes  $\Pi$  and T difficult to distinguish; that is to say, the tonic  $(\tau \circ \nu \circ \tau)$  chromatic with a comparatively high pitched T would not easily be compatible with the flat  $(\mu \alpha \lambda \alpha \kappa \circ \nu)$  diatonic with a comparatively low pitched  $\Pi$ . If, on the other hand, we take as diatonic every note which admits such an interpretation,  $\Upsilon$  and T must not be too close together; consequently the diatonic  $\Upsilon$  would not be compatible with the soft  $(\mu \alpha \lambda \alpha \kappa \circ \nu)$  chromatic in which T is comparatively low pitched. Indeed it would seem rational to assume that, when diatonic and chromatic *genera* were thus mixed *within* 

<sup>&</sup>lt;sup>14</sup> Similarly, if the sign K at the end of line 2 is to be interpreted as a Phrygian enharmonic note, it will be identical with diatonic  $\Lambda$ ; and consequently we should have no option but to take  $\Lambda$  itself as en-

harmonic to avoid an otiose duplication of signs.

15 In the diagram the space between the dots represents one twelfth of a tone.

a single tetrachord, the smaller chromatic intervals would be of the same size as the small diatonic intervals, that is to say, half a tone. Such a combination would consist of the sharp  $(\sigma \dot{\nu} \nu \tau \sigma \nu \sigma \nu)$  diatonic and the tonic  $(\tau \sigma \nu \iota \sigma \bar{\nu} \sigma \nu)$  chromatic; and this is the mixture I believe to be intended in our fragment.

We can now discuss the notes 0 1 K; and it will be most convenient

to take them in the order in which they appear in the papyrus.

The sign of is not found in either the Phrygian or the Hyperphrygian Such a sign, however, is found in a number of other scales, often as one of the fixed notes of a tetrachord with the value B, half a tone below Phrygian M; and we might suppose that the composer has adopted a sign from an alien τόνος in order to secure a note for which the Phrygian and Hyperphrygian made no provision. In that case the Perfect Fourth from  $\Upsilon$  to  $\Lambda$  (A<sub>b</sub> to D<sub>b</sub>) would be divided into five semitones and the chromaticism of the fragment exaggerated. It is easy also to suggest that the sign should properly be read as 0, or at least emended to 0; for such a sign appears in the Phrygian τόνος, though not in the Hyperphrygian. In the chromatic and diatonic genera o has approximately the value of E<sub>b</sub>. 16 But although the sign is not absolutely clear in the papyrus 17 it has a little tail at the right-hand side such as can be seen in the o of γονάτων. Consequently nothing short of musical necessity would justify us in emending the note to 0; and whether there is such a musical justification depends to a large extent upon the succeeding notes.

The sign 1 is not found in the Hyperphrygian; but it is one of the fixed notes in the Phrygian with the value D<sub>2</sub>, a whole tone above M.

The sign k is found both in the Hyperphrygian and in the Phrygian. In the tonic chromatic it is identical in pitch (D<sub>2</sub>) with the Phrygian note 1.18 Now as I suggested above, if this fragment is to be interpreted as a mixture of diatonic and chromatic, the only chromatic which would make such a mixture of genera within a tetrachord intelligible is this very tonic chromatic. Why then should the composer have used both I and k if they are identical in pitch? If the question at bottom is a legitimate one, the proper answer should be that I and K have different functions. Both notes are in the Phrygian τόνος; 1 is the fixed note Paramese, and K the Paranete of the tetrachord τῶν συνημμένων. The chief function of this latter tetrachord was to make modulation between related τόνοι easy. The Phrygian tetrachord τῶν συνημμένων is identical in pitch at every point with the tetrachord τῶν μέσων of the Hyperphrygian and forms a smooth transition between the one tovos and the other. Somewhere in the neighbourhood of the group IK we should expect to find a fairly definite indication of such a modulation, if we are right in interpreting the signs I and K as Phrygian. Is there then a modulation from the Phrygian to the Hyperphrygian τόνος? All the notes as far as M in the second line may fairly be regarded as Phrygian; but the note A, so far as it is Phrygian, is, like

<sup>&</sup>lt;sup>16</sup> In the enharmonic genus  $\Theta$  has the value  $D\times$ , one and a quarter tones above M. In the diatonic it is identical in pitch  $(E_b)$  with the Phrygian note, H.

<sup>17</sup> Professor Schubart suggested εν instead of O; I.H.S.—VOL. LI.

but of that he was very doubtful, and on musical grounds such a reading seems out of the question.

<sup>&</sup>lt;sup>18</sup> In the enharmonic genus K has the value  $\mathrm{D}_{\mathfrak{d}}$ , and is not identical in pitch with the note I.

κ, a note of the transitional tetrachord τῶν συνημμένων. The modulation, then, if such there be, is a hesitant one; it is indicated in the first note of the fragment, but never consummated. Yet this movement towards the Hyperphrygian is counteracted immediately before κ by the distinctly Phrygian ι and, it may be, by the definitely Phrygian θ. Or are we to look for the reverse: a modulation from the Hyperphrygian to the Phrygian? Again, as far as μ in the second line, we can regard the fragment as being Hyperphrygian with no hint of the Phrygian except that which is supplied by μ. The next two notes (if we read θ ι) would be distinctly Phrygian, and the function of the following κ would be to indicate a hasty return to the Hyperphrygian. In short, the interpretation of ι and κ as notes having identical pitch but different function seems pointless in this particular musical context. A still more important feature is that they do not provide any strong musical justification for reading the sign 0 as θ.

Some other solution is necessary which shall account for  $0 \mid \mathsf{K}$ . These three signs are found together in four  $\tau \acute{o} voi$ : the Hyperaeolian, Aeolian, Ionian, and Hypoionian. In all four 0 has the value of  $B\sharp$  (but in the two Aeolian  $\tau \acute{o} voi$  appears only in the diatonic genus), and  $\mathsf{K}$  the value of  $C\sharp$  (in all three genera).  $\mathsf{I}$  is a chromatic or diatonic note with the value  $D\sharp$ . Owing to the lack of context we cannot decide between these four  $\tau \acute{o} voi$ ; but it is tolerably certain that there is a bold modulation at 0 from the Phrygian or Hyperphrygian to one or other of the four.

Some other details remain to be discussed. At the beginning of the second line there is some trace of a horizontal stroke which can be interpreted in various ways. (a) The sign — appears in the Phrygian as a fixed note, the Proslambanomenos, but since it has a value Ca almost two octaves below the sign  $\vee$ , and a seventh below the sign  $\Pi$  which immediately follows it, we cannot, on musical grounds, accept such an interpretation. (b) The stroke might be the bottom of a  $\Delta$ ; but such a sign does not appear in the Phrygian or Hyperphrygian τόνος, and since there is no reason at this point for suspecting another τόνος, we must reject this reading of the sign. (c) The sign H appears in the Phrygian and Hyperphrygian diatonic with the approximate value of E<sub>b</sub> and in the Phrygian chromatic with the value of F<sub>b</sub>. On musical grounds there is no reason to reject the interpretation, but since there is no trace of either vertical stroke, I am not convinced that palaeographical considerations will permit it. (d) The sign  $\bot$  is a fixed note in the Hyperphrygian and a diatonic note in the Phrygian, with the value  $B_b$ , exactly an octave above the note  $\Pi$  which immediately follows. So far as the traces on the papyrus are concerned, this is a satisfactory reading. Musically it involves a leap of an octave between 1 and Π; and this leap is followed by another octave leap between T and Y.<sup>20</sup> Elsewhere

<sup>19</sup> In all four τόνοι the sign I also has an enharmonic value, one quarter of a tone above C#.

<sup>&</sup>lt;sup>20</sup> This second leap is beyond suspicion; for  $\forall$  is written very clearly and there would be insuperable difficulties in emending it to  $\checkmark$  (an instrumental

note = C, which does not appear in the Phrygian or Hyperphrygian and would in any case be an otiose duplicate of the sign M) or to  $\psi$  (which appears only in Dorian  $\tau \acute{o}voi = G \acute{o}$ ) or to  $\Upsilon$  (which the scribe had already written twice without faltering).

the melody of the fragment is rather circumscribed and the succession of two octave leaps is unexpected; but a singer could perform the progression without discomfort or risk, and we shall probably have interpreted the

papyrus aright if we accept 1 as the true reading.

The note in the third line presents a number of peculiarities. It is written over the consonant at the right of the vowel, whereas the other notes are either over a vowel or to the left of it. The form of the sign bears no clear relation to any Greek musical note. Apparently the writer made some sort of a slip which he has corrected; perhaps he was influenced by the N of the text. I cannot divine his intention and have no interpretation to offer.<sup>21</sup>

Below I give two renderings of the fragment in our own musical notation; but it should be understood that the intervals of a modern pianoforte merely approximate to the Greek intervals. The first transcription is based on the assumption that the composer used a mixture of the diatonic and chromatic genera; and there can be little doubt, I think, that musical and historical probabilities are all in favour of such an interpretation. The second transcription involves a mixture of enharmonic and diatonic; but since there is no parallel for such a mixture, either in the other fragments of Greek music or in the musical theorists, no great confidence should be placed in the rendering.

#### A. DIATONIC AND CHROMATIC

A. DIATONIC AND CHROMATIC.



### B. DIATONIC AND ENHARMONIC

B. DIATONIC AND ENHARMONIC.



The melody is too circumscribed for the most part for any deductions to be made about the mode in which the piece is written. Nor is there

that the sign is a combination of  $\Lambda$  and T, or that it was intended to be  $\pi$ .

Since this article was in type, Mr. Edgar has written to me as follows: "When I was staying in Cairo this winter, I re-examined the musical papyrus and made the following notes: l. 2: The vestiges of the first two letters suggest  $\epsilon_1$ , but the reading is very doubtful. The last letter seems to be either a rather large 0 or an  $\epsilon$ . l. 3: The first letter is uncertain, but  $\delta$  seems quite possible. So I do not think your transcript requires alteration."

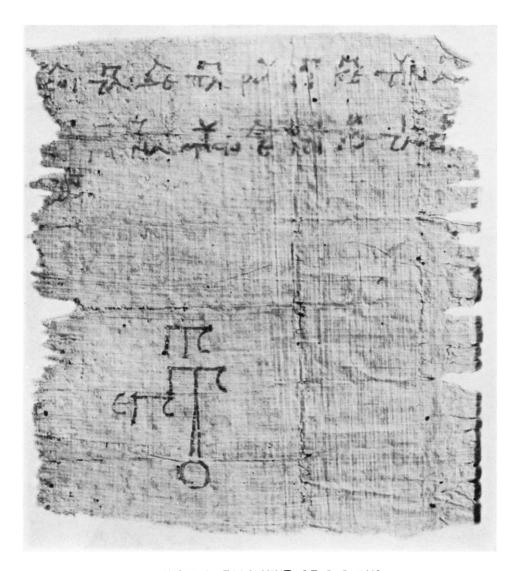
<sup>21</sup> Mr. Battiscombe Gunn's careful copy of the sign shows that the bar extended to the left-hand vertical stroke and beyond the right-hand stroke of the N and that there was a little circle in the top left-hand corner of the letter. The sign N is found in some τόνοι as an instrumental note (= F), in others as a vocal note (= Dp). Among the latter τόνοι is the Ionian, which is one of the four involved in the modulation I suggest at OIK. Perhaps that modulation was a permanent one and the piece continued in the Ionian τόνος to the end. The bar at the top can scarcely be the diseme mark. It is also unlikely

any point in the text of the fragment which would call for an appropriate musical cadence. Furthermore, the mixture of genera within a tetrachord, which this piece exhibits, tends to obliterate the distinctions of mode, since the Perfect Fourth is broken up into more than three intervals and its fundamental structure is thereby obscured. The general impression which this fragment makes is that it was composed, not in the fifth or early fourth century B.C., but in a period of decadence.

In most of our fragments of Greek music, the rise and fall of the melody bear a close relationship to the accents of the words. In this new piece the music agrees with the acute accent in inétiv; but it is against the acute in  $\tau \acute{\alpha} \delta \epsilon$  and  $\gamma o v \acute{\alpha} \tau \omega v$ . Although the first syllable of  $\xi \pi i$  is set higher than the second, the preceding barytone is still higher. The circumflex accents of  $\tau \check{\alpha} \rho$  and  $\check{\omega} v$  are not indicated in the melody. So far as attention to the word accents is concerned, this fragment is nearer to the *Orestes* fragment and to the Ajax piece in the Berlin papyrus than it is to the Delphic Hymns, the Aidin epitaph, and the Berlin Paean.

Frankly, this new piece of ancient music is something of a disappointment. Though it affords another interesting example of a mixture of genera, it is too short to be of great musical interest. So far as it goes, it does not confirm the principles which have been deduced from other fragments for the relation of melody to accent; and no new evidence is here provided to settle the problems of prosody raised by the στιγμαί and the λεῖμμα in the Berlin fragments and the Aidin epitaph. Perhaps we ought to feel relieved that a study of the fragment has revealed no new complications or difficulties in the cumbersome notation of the Greek musical system.

J. F. Mountford.



A MUSICAL FRAGMENT OF PAPYRUS.
(Cairo 59533).



An Oxyrhynchus Fragment on Harmonic Theory

Author(s): Andrew Barker

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# AN OXYRHYNCHUS FRAGMENT ON HARMONIC THEORY

The tattered remains of a few paragraphs of a work on harmonic theory were published in 1986 as *P. Oxy.* LIII.3706, with a careful commentary by M. W. Haslam.<sup>1</sup> There are six fragments. Four of them (frr. 3–6) are too small for any substantial sense to be recovered; and while fr. 2 and the second column of fr. 1 allow us to pick out significant words and phrases here and there, the remnants of these columns are very narrow, and the line of reasoning seems inaccessible. Musicological analysis must focus on the first column of fr. 1. There is little enough even of that, and in attempting a relatively detailed interpretation I shall have to be rather less cautious than Haslam quite properly was. But I think that something can be made of it without stretching speculation too far, and if I am right the piece is of some genuine interest. Here are the two versions of the text that Haslam prints. The first records what is decipherable on the papyrus itself, while the second represents a partial reconstruction, restoring word-divisions and some of the missing letters.

```
Ικυα[ ]
                          ]τολυ []
                                                                              ]\tau o\lambda v[]
                         ]ελελιζο
                                                                             ] ἐλελιζο-
                         ]εκδια
                                                                             ] ἐκ δια-
 5
                                                                           μ]εικτή μελο-
                       ] . . κτημελο
                                                         ]\tau[..]. οιον. τριτοειδης...
       ]\tau[..]. οιον... ριτοειδης...
       ] . μειξειουκ'μαλιςταυτςς
                                                         ] .μειξειου κ(αὶ) μάλιςτ' αὐτ(αῖ)ς
       ]αιτοηθοςμελωδειταιγ
                                                         ]αι τὸ ήθος μελωδείται γ(ὰρ)
       ]διατονουπαρα....[]
                                                          ] διατόνου παρανήτη[ς]
                                                     10 cvv]εχές δ(ε) τοῦθ' ἄπαν
10
       ]εχ[ή] εδτουθαπαν
                                                          ]ριτης τη̂[.] ὀξυτέρα
        [\rho_i \tau \eta c \tau \eta[.] o \xi v \tau \epsilon \rho a.[]
                                                          ] . ον διαβαίνει [
         ] ονδιαβα ει [
         ]ωκ 'εναρμον[
                                                           ]ω κ(αὶ) ἐναρμον[ίω
         ]λλαδειτουτ[
                                                           ]λλα δεῖ τουτ[
15
                                                     15 ]λον \mu[....]..[
         ]λον\mu[ . . . .] . . [
                                                            ]\tau o\tau[
          ]\tau o\tau[
          ].\mu.[
                                                            ] \mu(\epsilon v)0\mu[
```

In the bulk of this paper I shall be offering as full an interpretation as I can of the argument that this passage seems to have contained. At the end I shall turn very briefly to wider issues, attempting to draw some inferences about the character of the work from which it came, and to decide whether its contents add anything to our knowledge of Greek harmonics or are merely repetitions of familiar doctrine. I shall resist the temptation to speculate about its authorship. As will become clear, Haslam was certainly right to locate it in the Aristoxenian tradition; but so far as I can tell it might have been written at any time between the fourth century B.C. and the date of the papyrus itself (second or third century A.D.).

The task of analysis will be easier if we can find some way of identifying the topic under discussion reasonably precisely in advance, before attempting to reconstruct the details of the passage as a whole. The more sharply the subject matter can be pinpointed at this stage, the easier it will be to work out how the argument runs, and to guess at the contents of lacunae. (Any such prior identification of a subject must of

<sup>&</sup>lt;sup>1</sup> The Oxyrhynchus Papyri, vol. LIII (1986), ed. M. W. Haslam, pp. 49-55.

course be hypothetical, inviting support, modification or explosion when the minutiae begin to be filled in.) Haslam was probably correct, I think, in locating the general area of discussion by reference to the concept of mixis.<sup>2</sup> In line 5,  $\mu\epsilon\iota\kappa\tau\dot{\eta}$   $\mu\epsilon\lambda o\pi o\iota\dot{\iota}a$  seems almost certain.<sup>3</sup> In line 7 we have the slightly confusing group of letters  $\mu\epsilon\iota\xi\iota ov$  or  $\mu\epsilon\iota\xi\epsilon\iota ov$ , in which the same word-stem is surely involved: I cannot bring myself to believe in the hypothetical music-theorist Meixias conjured up in Haslam's note on this line (p. 53: I cannot in fact see how to accommodate a reference to any named individual at this point in the text). The word  $\mu\iota\kappa\tau\dot{\eta}$  appears in fr. 2.12, and though the papyrus remnants provide little intelligible context for it we can be confident that musical technicalities are still in play, in view of the indubitable reference to a tetrachord or tetrachords in the next line (the surviving letters are  $\tau\epsilon\tau\rho\alpha\chi$ ).

Allusions to 'mixture' appear in musicological writings in the same context as references to 'modulation' ( $\mu\epsilon\tau\alpha\beta\delta\lambda\eta$ ), that is, where an author is contemplating a continuous sequence of notes not all of which belong to the same system (very roughly, the same 'scale'), as such things are conceived by harmonic theorists.<sup>4</sup> Such a sequence is said to be a 'mixture' of elements from several systems, or to 'modulate' between them, to shift ( $\mu\epsilon\tau\alpha\beta\acute{\alpha}\lambda\lambda\epsilon\sigma\theta\alpha\iota$ ) from one to another. If the word  $\mu\epsilon\lambda\sigma\pi\iota\acute{\alpha}$  is right in line 5, the author is thinking of techniques whereby a composer mingles elements from several scalar systems in a single melody. It should be noted that mixtures and modulations were not merely products of the theorists' imaginations: there are plenty of examples in surviving scores.<sup>5</sup>

But this way of identifying the subject is too broad to be satisfactory. Greek writers classified scale-structures according to several different criteria, and could therefore envisage modulations or mixtures of several sorts. (Rather similarly, the musicology of the modern 'classical' tradition classifies according to key and according to mode, and can distinguish modulations of key, as from C major to G major, from modulations of mode, as from C major to C minor.) We hear of modulations of  $\gamma \acute{\epsilon} \nu o s$ , of  $\tau \acute{o} \nu o s$  (in at least two senses), of  $\sigma \acute{\nu} \sigma \tau \eta \mu a$ , and so on; and it would be an advantage if we knew which of them was under examination here.

Though he concedes that the sense of 'mixed *melopoiia*' must remain uncertain here, Haslam is confident that one of the topics under discussion is change of genus.<sup>7</sup>

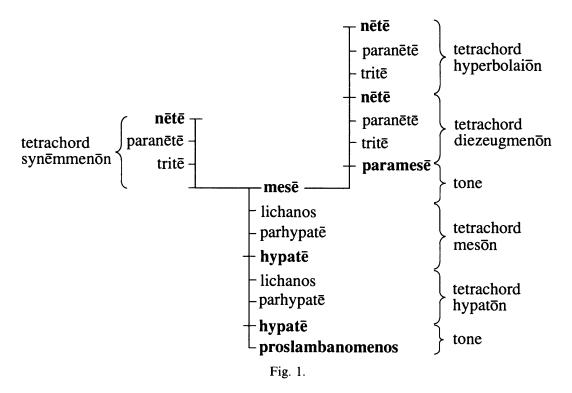
- <sup>2</sup> See his prefatory comments (p. 49) and note on line 5 (p. 52).
- <sup>3</sup> Haslam's statements in his note on this line (p. 52) that  $\mu\epsilon\lambda o\pi o\iota$  is 'very probable' and that  $\mu\epsilon\iota\kappa\tau\dot{\eta}$   $\mu\epsilon\lambda o\pi o\iota\dot{\iota}a$  'would well suit the remains' seem to me to underplay his hand. I would reckon the case almost conclusive, despite the different spelling  $\mu\iota\kappa\tau\dot{\eta}$  in fr. 2.12.
- <sup>4</sup> Aristoxenus uses the terms  $\mu$ ίξις,  $\mu$ ικτός, etc. in this kind of context at *El. Harm.* 7.3, 7.6, 17.26, 44.26; compare e.g. Cleonides, *Eisagoge* 6 (189.11, 15 Jan), Ptol. *Harm.* I.16 (especially 38.33–39.14, 40.8–10 Düring), II.6 (56.1–4). In these Ptolemaic passages references to  $\mu$ ίξις and to  $\mu$ εταβολή are regularly linked. For other discussions of  $\mu$ εταβολή in these authors see Aristox. *El. Harm.* 7.10–8.3, 38.6–17, cf. 34.8–11, 40.12–24, Cleonides, *Eisagoge* 11 and 13, Ptol. *Harm.* II.6–11, and see also especially Aristides Quintilianus, *De mus.* 22.11–26 with context.
- <sup>5</sup> For a convenient summary see M. L. West, *Ancient Greek Music* (Oxford, 1992), pp. 195–6. More detail is offered in his notes on individual compositions (ch. 10): for fuller discussion see E. Pöhlmann, *Denkmäler Altgriechischer Musik* (Nürnberg, 1970). The brief remarks introducing each composition in J. Chailley, *La musique grecque antique* (Paris, 1979), ch. 8 are especially helpful for present purposes, since the presence or absence of modulation is a feature to which the author regularly draws attention.
- <sup>6</sup> For lists and brief characterisations see Cleonides, *Eisagoge* 13, Bacchius, *Eisagoge* 50–8, Anon. Bell. II.27, III.65.
- <sup>7</sup> In his note to line 5, p. 52. According to the Greek theorists, the basis of all musical systems (scales) is the division of each octave into two stretches each spanning a perfect fourth, together with the interval of a tone (in the paradigmatic form of the octave this is placed between the two fourths), thus: E-A, B-E'. Each of the fourths is then subdivided by the insertion of two further notes, which with the notes bounding the fourth constitute a 'tetrachord'. While the positions

I think he is probably mistaken. Genera are indeed mentioned (diatonic in line 9 and perhaps in line 4, enharmonic and probably chromatic in line 13), while there are no traces of the names of tonoi or harmoniai, and no indication that words such as τούος, άρμονία, είδος, σύστημα and so on figured anywhere in this discussion. Nevertheless, the run of the text seems to undermine the natural inference that the focus of the passage is on mixtures of genera. After some prefatory remarks, I suggest, it contained first a proposition about mixed melopoiia, perhaps in two sentences (lines 3-5, 6-8), and secondly an explanation of the proposition ( $\mu \epsilon \lambda \omega \delta \epsilon i \tau \alpha \iota \gamma \dot{\alpha} \rho ...$ ), probably continuing as far as  $\delta \iota \alpha \beta \alpha i \nu \epsilon \iota$  in line 12. So far we are in territory where there are, apparently, references to the diatonic genus only. Enharmonic and (probably) chromatic appear in the next line,8 but in a setting that strongly suggests a contrast rather than an association with what is said of the diatonic in the preceding lines; for if  $\partial \lambda \partial \delta \hat{\epsilon}$  is correct in line 14, the most probable thread of sense from the gap after  $\delta\iota\alpha\beta\alpha\iota\nu\epsilon\iota$  in line 12 down to this point is surely: 'but this (the contents of lines 3-8) is not the case in chromatic and enharmonic: rather, one must (ἀλλὰ δεî ...) ...'.

In that case we need to identify a kind of mixis of which some significant proposition is true when diatonic sequences are under consideration, but not otherwise; and mixtures of genera cannot be involved. It should be a proposition that the present stretch of text can plausibly be supposed to have expressed and explicated. Our analysis should also take into account another point correctly noted by Haslam (initially on p. 49), but from which he drew no conclusions. When Aristoxenus discusses differences of genus by reference to the inner, 'moveable' notes of a tetrachord, he takes as his example the tetrachord meson (which approaches meso from below, its notes being hypatē, parhypatē, lichanos, mesē).9 All later writers follow him. But the notes named or alluded to by the present writer do not belong to this tetrachord: notes called trite and paranete are found only in tetrachords that lie in the upper part of the system, above mesē. In theory, as Haslam says, this need make no difference, since every tetrachord in any one (theoretical) system had exactly the same internal structure: a tetrachord whose form is determined by the positions of trite and paranete could be used as a paradigm in this context just as appropriately as one involving parhypatē and lichanos. Nevertheless, the habit of focussing on the tetrachord meson in this context seems so well entrenched among writers on harmonics that it is scarcely convincing to dismiss the Oxyrhynchus author's usage as merely incidental. If he concentrated on the tetrachords above mesē, it is likely that he had good theoretical reasons for doing so.

of the notes bounding the tetrachord are fixed relative to one another and to other notes in the initial framework, those of the notes inside each tetrachord are not. The three 'genera' and their subspecies are distinguished from one another by the positions of the two inner notes of the tetrachord, especially the higher of them, in relation to the tetrachord's boundaries. Very roughly speaking, if the higher moveable note is placed very low in the tetrachord, the genus is enharmonic: if it is placed at or above the mid-point in this span the genus is diatonic: between these extremes the genus is chromatic.

- <sup>8</sup> The reference to chromatic is inferred rather than observed, but is really in little doubt. Haslam's note to line 13 (p. 54) presupposes that where we have a phrase of the form 'x and enharmonic', 'x' must be either 'chromatic' or 'diatonic'. At first blush this seems a pretty sweeping assumption. I have not run a detailed check on it. In fact, however, I would be astonished if it turned out to be wrong in more than a tiny minority of cases.
- $^9$  El. Harm. 21.31–22.21 (cf. 46.19–24). Aristoxenus explains that his choice of this tetrachord to exemplify the changes by which shifts of genus are produced is only a matter of convenience: of the various groups of notes that could have been chosen by way of example, this one happens to be  $\sigma \chi \epsilon \delta \delta \nu \gamma \nu \omega \rho \iota \mu \omega \tau \acute{a} \tau \eta \tau o is \dot{a} \pi \tau o \mu \acute{e} \nu o \iota s$ .



The general direction in which these considerations point is unmistakable. When the complete system of notes is set out in its standard form, it follows a linear series through the first octave from proslambanomenos up to mesē, the octave being constituted by the interval of a tone at the bottom followed by two tetrachords in conjunction.<sup>10</sup> Above mesē, however, the series is conceived as having alternative continuations. It may proceed either to a further tetrachord in conjunction with the tetrachord meson, known as the tetrachord synemmenon, or to a tetrachord disjoined from meson by the interval of a tone, the tetrachord diezeugmenon. (Above this and in conjunction with it lies a further tetrachord, hyperbolaion, completing the double octave; but this need not concern us here.) In the diatonic genus as most commonly conceived, each tetrachord rises through the series of intervals semitone, tone, tone, as in the sequence from E to A on a modern keyboard. Thus if EFGA corresponds to the tetrachord meson, with meso on A, the alternative continuations upwards are (A)BbCD (synēmmenon) and BCDE (diezeugmenon). The Greek names for the second, third and fourth notes in each of these tetrachords are trite, paranete and nētē: when distinctions need to be made, the word synēmmenon or diezeugmenon is added to the name. The diagram above (Fig. 1) may help to clarify the arrangement.

A form of modulation that seems to have been very familiar, and to which several writers give a special name of its own, modulation 'of systēma', is that in which progressions through notes in both of these tetrachords are combined in a single sequence. Cleonides, for example, defines it as occurring 'when a modulation is made from conjunction to disjunction or the reverse' (Eisagoge 13, 205.5-6 Jan): he has

Tetrachords are said to be in conjunction  $(\sigma v v \eta \mu \mu \acute{e} v a, \kappa a \tau \grave{a} \sigma v v a \acute{q} \acute{\eta} v)$  when they are so linked in a series that the top note of one tetrachord serves also as the bottom note of the next. They are in disjunction  $(\delta \iota \epsilon \zeta \epsilon v \gamma \mu \acute{e} v a, \kappa a \tau \grave{a} \delta \iota \acute{a} \zeta \epsilon v \xi v)$  when they are separated by an interval that stands outside either tetrachord, and this interval is always a tone. (Thus the series of white notes on a keyboard from B up to A constitutes a pair of tetrachords in conjunction, sharing the note E, while the series from E to E' is a pair of tetrachords in disjunction, E-A and B-E, separated by the tone A-B.) See especially Aristox. El. Harm. 58.14–60.9.

discussed the 'conjunct' and 'disjunct' forms of system a little earlier (Eisagoge 10–11). Similar definitions appear in Aristides Quintilianus (De musica 29.12–14 Winnington-Ingram)<sup>11</sup> and perhaps in Bacchius (Eisagoge 51, 304.10–12 Jan), though here the text needs a minor emendation to secure an equivalent sense.<sup>12</sup> The phenomenon is also discussed at length by Ptolemy (Harm. II.6, 53.28–57.9 Düring): his purpose is to demonstrate that the tetrachord synēmmenon need not be construed as belonging to a genuinely distinct system, but can be reached within the framework of the 'disjunct' system through a modulation of a different sort, familiar in other contexts. The sort of modulation we are discussing, he argues, need not be treated as a special case, involving a peculiar theoretical apparatus of its own.

It is precisely this sort of modulation, I suggest, that is being considered in the papyrus fragment.<sup>13</sup> I shall attempt to clarify and substantiate the hypothesis through a more or less continuous reconstruction of the text, with comments along the way.

Line 5 apparently referred to  $\mu\epsilon\iota\kappa\tau\dot{\gamma}$   $\mu\epsilon\lambda\sigma\sigma\iota\dot{\iota}a$ , 'mixed melodic composition'. It is clear from the sequel that the author has some particular nexus of notes in mind: let us provisionally assume that the missing portions of lines 4–5 contained a reference to the note  $paran\bar{e}t\bar{e}$ . (There is some slight evidence for this. In line 4 we have the remnant  $\dot{\epsilon}\kappa$   $\delta\iota a$ -, and when the prefix  $\delta\iota a$ - reappears in line 9 it is in the phrase  $\delta\iota a\tau\dot{\rho}\nu\sigma\upsilon$   $\pi a\rho a\nu\dot{\eta}\tau\eta s$ . Perhaps the same phrase occurred earlier too.) We might then reconstruct line 6 and the beginning of 7 roughly as follows:  $\dot{\epsilon}\sigma\tau\iota$   $\delta\dot{\epsilon}$  (or  $\gamma\dot{\iota}\nu\epsilon\tau\alpha\iota$   $\delta$ ')  $oio\nu\epsilon\dot{\iota}$   $\tau\rho\iota\tau o\epsilon\iota\dot{\delta}\dot{\gamma}s$   $\dot{\epsilon}\nu$   $\tau\dot{\eta}$   $\mu\epsilon\dot{\iota}\dot{\xi}\epsilon\iota$ , 'but it is (or 'becomes') as it were of the nature of a trite in the mixture'. That is, the note which is diatonic  $paran\bar{e}t\bar{e}$  in the context of the tetrachord  $syn\bar{e}mmen\bar{o}n$  becomes 'as it were' a  $trit\bar{e}$  when mixed into a sequence with notes belonging to the tetrachord  $diezeugmen\bar{o}n$ . As Nicomachus, for example, points out, in the most familiar form of the diatonic genus  $paran\bar{e}t\bar{e}$   $diezeugmen\bar{o}n$  and  $n\bar{e}t\bar{e}$   $syn\bar{e}mmen\bar{o}n$  have the same pitch (Enchiridion 11, 259.11–13 Jan), and the same is true of  $paran\bar{e}t\bar{e}$   $syn\bar{e}mmen\bar{o}n$  and  $trit\bar{e}$   $diezeugmen\bar{o}n$ .

The sequel in lines 7–8 reads ov  $\kappa \alpha i \mu \dot{\alpha} \lambda i \sigma \tau' \alpha \dot{v} \tau \dot{\alpha} i s / \dots - \alpha \iota \tau \dot{\sigma} \dot{\eta} \theta \sigma s$ . Haslam plausibly suggests  $\mu \epsilon \tau \alpha \beta \dot{\alpha} \lambda \lambda \epsilon \tau \alpha \iota$  at the beginning of line 8:  $\sigma \nu \mu \mu \epsilon \tau \alpha \beta \dot{\alpha} \lambda \lambda \epsilon \tau \alpha \iota$ , if it would fit the space, might be even better. Reading the first two letters as  $\sigma \dot{v}$ , and placing a comma before them, we get something that might have the sense 'whose character is most especially altered by them' (or 'along with them'); or with a different verb,  $\sigma \nu \nu \dot{\alpha} \pi \tau \epsilon \tau \alpha \iota$  for example, the gist might be 'whose character is particularly closely tied to them'. But the reference of 'them',  $\alpha \dot{\nu} \tau \alpha i s$ , is unclear. One might try to take it as referring to the adjacent notes, explaining the gender by

<sup>&</sup>lt;sup>11</sup> Here the subject is broached initially in a discussion of forms of melodic progression, rather than merely of scale structure, and what is defined is  $\partial \psi \psi \dot{\eta} \pi \epsilon \rho \iota \phi \epsilon \rho \dot{\eta} s$ , 'circular progression': it is said to proceed upwards through notes in conjunction, downwards through notes in disjunction. But Aristides adds that the topic is one that is also studied in the context of modulation.

<sup>&</sup>lt;sup>12</sup> The emendation is small but crucial, involving the insertion of a negative. See L. Zanoncelli, *La manualistica musicale greca* (Milan, 1990), p. 295 n. 37.

<sup>&</sup>lt;sup>13</sup> Haslam hints at some of the points on which this interpretation is based at the end of his note on line 6 (pp. 52-3), but seems not to think them worth pursuing.

<sup>&</sup>lt;sup>14</sup> The word  $\tau \rho \iota \tau o \epsilon \iota \delta \eta s$  is not met elsewhere, but its formation is parallel to terms such as  $\lambda \iota \chi \alpha \nu o \epsilon \iota \delta \eta s$ ,  $\dot{\nu} \pi \alpha \tau o \epsilon \iota \delta \eta s$ , and so on, which are quite common in harmonic texts. Close analogues for the usage we seem to have here are at e.g. Aristides Quintilianus, *De mus.* 9.21, 25, 26. The sense of such terms can vary with context: thus e.g. Aristides' use of  $\dot{\nu} \pi \alpha \tau o \epsilon \iota \delta \eta s$  and  $\mu \epsilon \sigma o \epsilon \iota \delta \eta s$  at 81.21–3 is substantially different, as is that of Anon. Bell. at III.63–4.

<sup>&</sup>lt;sup>15</sup> There are a good many other possibilities. An author with Platonist leanings, like Aristides Quintilianus for instance, might have written  $\delta\mu$ οιοῦται or one of its compounds: cf. e.g. De mus. 76.21, 79.25.

reference to the fact that their names are feminine (they are in origin adjectives, the noun  $\chi o \rho \delta \dot{\eta}$  being understood). But the usage would be most unusual, and becomes quite impossible if  $o\dot{v}$  also refers to a note  $(\phi \theta \dot{o} \gamma \gamma o s)$ , the one that has become  $\tau \rho \iota \tau o \epsilon \iota \delta \dot{\eta} s$ . Of the various other possibilities that suggest themselves, the best, I think, is to take the copyist's confusion at the beginning of line 7 as concealing  $\tau a \hat{\iota} s \mu \epsilon \iota \xi \epsilon \sigma \iota$ , rather than  $\tau \hat{\eta} \mu \epsilon \iota \xi \epsilon \iota$ : then  $a \dot{v} \tau a \hat{\iota} s$  is 'the mixtures', and there is nothing mysterious is the assertion that the character of a note is changed by them or along with them, or is assimilated to them. The  $\kappa a \hat{\iota} \ln \kappa a \hat{\iota} \mu \dot{a} \lambda \iota \sigma \tau a$  may be merely intensitive, but the sense 'also' is perfectly possible: the  $\hat{\eta} \theta o s$  of the note, as well as its name and its locus in the tetrachord, is dependent on the 'mixture' in which it is embedded. <sup>16</sup>

With  $\mu\epsilon\lambda\omega\delta\epsilon\hat{\imath}\tau\alpha\imath$   $\gamma\lambda\hat{\rho}$  in line 8 the author apparently proceeds to an explanation of what he has so far said. I suggest a continuation of the following sort, down to line 12.  $\mu\epsilon\lambda\omega\delta\epsilon\hat{\imath}\tau\alpha\imath$   $\gamma\lambda\hat{\rho}$  /  $\tau\hat{\eta}$   $\delta\imath\alpha\tau\acute{\rho}vov$   $\pi\alpha\rho\alphav\acute{\eta}\tau\eta_S$ , /  $\sigma vv\epsilon\chi\dot{\epsilon}_S$   $\delta\dot{\epsilon}$   $\tau o\hat{\imath}\theta$ '  $\delta\pi\alpha v\tau\alpha$   $\tau\dot{\rho}v$  /  $\tau\hat{\eta}_S$   $\tau\hat{\rho}i\tau\eta_S$   $\tau\hat{\eta}_S$   $\delta\dot{\xi}v\tau\dot{\epsilon}\rho\alpha_S$  /  $\tau\acute{\rho}\pi v$   $\delta\imath\alpha\beta\alpha\acute{\iota}v\epsilon\iota$ . On this reading,  $\tau\dot{\delta}$  in line 9 and  $\tau o\hat{\imath}\theta$ ' in line 10 pick up the word  $\tilde{\eta}\theta\sigma_S$ , which I take to overlap in sense here with the Aristoxenian term  $\delta\acute{v}v\alpha\mu\iota_S$ , 'musical character', 'melodic function'. The sense will be: 'for there is sung the character (note-function) of diatonic  $\rho \alpha ran\bar{\epsilon}t\bar{\epsilon}$ , but this traverses, without discontinuity, the whole of the range of the higher  $trit\bar{\epsilon}$ '. This looks

References to changes in  $\hat{\eta}\theta_{0S}$  might suggest that the kind of  $\mu\epsilon\tau\alpha\beta\delta\lambda\dot{\eta}$  being discussed is after all not μεταβολὴ κατὰ σύστημα as Cleonides defines it, but what Cleonides calls μεταβολὴ $\kappa \alpha \tau \dot{\alpha} \mu \epsilon \lambda \sigma \pi o i (\alpha r)$  and defines by reference to change of  $\dot{\eta} \theta o_S$  (Eisag. 13, 206.3–18), while Bacchius straightforwardly calls it  $\mu\epsilon\tau\alpha\beta$ o $\lambda\dot{\eta}$   $\kappa\alpha\tau\dot{\alpha}$   $\dot{\eta}\theta$ os (Eisag. 50 and 54): cf. also Aristides Quint. De mus. 30.1–17. The association of the terms  $\mu \epsilon \lambda o \pi o \iota i \alpha$  and  $\eta \theta o s$  in Cleonides (also in Aristides) might seem a strong pointer. But I think this is unlikely. None of the Aristoxenian sources gives any sign of believing that such 'modulation of ethos' could be given a closely technical analysis: none of the structuring concepts of harmonic theory, such as those used to characterize other forms of modulation, appear in connection with this one, which is defined only in impressionistic terms related to aesthetic response. The Oxyrhynchus author, by contrast, is plainly offering a technical analysis grounded in Aristoxenian theory. It is however worth noting the unusual definition given for  $\mu\epsilon\tau\alpha\beta$ o $\lambda\dot{\eta}$   $\kappa\alpha\tau\dot{\alpha}$   $\dot{\eta}\theta$ os at Anon. Bell. II.27: it occurs  $\delta\tau\alpha\nu$   $\dot{\epsilon}\nu$   $\alpha\dot{\nu}\tau\hat{\nu}\hat{\iota}s$ τετραχόρδοις τὰ ἤθη τῶν φθόγγων τὴν μετάπτωσιν λαμβάνη. The kind of modulation envisaged is certainly different from that given the same name by Bacchius. But what does the definition mean? It cannot be alluding to those movements of notes in the tetrachord that create modulations of genus, since that sort of modulation is explicitly distinguished from  $\mu\epsilon\tau\alpha\beta\circ\lambda\dot{\gamma}$  $\kappa \alpha \tau \dot{\alpha} \dot{\eta} \theta o s$ , and has been defined in the preceding lines. Most probably, I think,  $\dot{\epsilon} \nu \alpha \dot{\nu} \tau o \hat{\iota} s \tau o \hat{\iota} s$  $\tau \epsilon \tau \rho \alpha \chi \delta \rho \delta o is$  is to be taken closely with  $\tau \dot{\alpha} \ \ddot{\eta} \theta \eta$ . What changes is a note's character in a tetrachord: that is, it acquires a different role in the tetrachord, for instance by becoming a tetrachord's bounding note when previously it was not. This is just the sort of 'change of character' that is generated by Cleonides'  $\mu\epsilon\tau\alpha\beta\circ\lambda\dot{\eta}$   $\kappa\alpha\tau\dot{\alpha}$   $\sigma\dot{\nu}\sigma\tau\eta\mu\alpha$  (a kind of modulation not mentioned by this name in the list given by Anon. Bell.).

 $\tau \circ \pi \circ s$  is Aristoxenus' regular term for the range within which a moveable note can move. For the expression  $\tau \circ \pi \circ \nu \circ \delta \iota \alpha \beta \alpha \iota \nu \in \nu$ , though in a slightly different context, see *El. Harm.* 9.16. Haslam (p. 50) reports traces as of a  $\pi$  in the gap before  $- \circ \nu \delta \iota \alpha \beta$ .

<sup>18</sup> The concept of a note's δύναμις is of central importance in Book II of Aristox. El. Harm. It is nowhere defined, but seems to be constituted by the relations in which a note stands, and may legitimately stand, to others and to the system of which it is a part. The doctrine that a note's identity lies in its δύναμις is contrasted with the view (stated in Book I, 15.15–16) that a note is merely 'the incidence of the voice on a single pitch': see 36.6–14. For other important occurrences of the term see 33.6–9, 33.34–34.5, 36.4–6, 40.4–24, 47.29–48.7, 49.2–7; cf. also my discussion in 'Aristoxenus' Theorems and the Foundations of Harmonic Science', Ancient Philosophy 4 (1984), pp. 23–64, particularly Section VII. No author uses the word ηθos as a direct equivalent for the Aristoxenian δύναμις (though the usage at Anon. Bell. II.27, n. 16 above, seems to be close), and I do not suggest that the present author does so. We do however find the view that individual notes possess 'character', and that this is closely linked to their positions in the tetrachord and other 'dynamic' properties: the view is elaborated most fully at Aristides Quintilianus, De mus. 77.17–82.3.

initially like an overcomplicated way of making Nicomachus' point that diatonic paranētē (synēmmenōn) and tritē (diezeugmenōn), here quite appropriately called the 'higher' tritē, standardly have the same pitch. But in fact the complexities are not otiose.

The point that the writer is making can be identified with some precision in the context of Aristoxenian theory.<sup>19</sup> To begin with, the identity of a note, as indicated by its name, is never determined solely by its pitch, but depends on its  $\delta \dot{\nu} \nu a \mu \iota s$ ; and this depends in turn on the relation in which the note stands to other notes and systems of notes in its vicinity. The note under consideration here acquires the character,  $\hat{\eta}\theta_{0S}$  or  $\delta \dot{v}va\mu \iota_{S}$ , of a paranete from the sequence of notes from which it emerges, and hence it strikes the ear as a paranētē at the moment when it is sung  $(\mu \epsilon \lambda \omega \delta \epsilon i \tau \alpha \iota)$ . But in the light of the notes that follow, its character is transformed into that of a trite, a note with a quite different function in the tetrachord and different relations to its surroundings. Secondly, this is musically possible because, as our author says, notes with the character of a diatonic paranētē inhabit the same range of pitch as notes with the character of a trite. But what exactly does this mean, and why does the author speak of a 'range' over which the two note-functions coincide, rather than merely asserting the identity of their pitches? The point requires some careful unravelling. According to Aristoxenus, the moveable notes within the tetrachord do not have fixed locations with respect to the tetrachord's boundaries, even when they are restricted to a single genus. They have a small but determinate range of variation, and they may be placed anywhere within its span.<sup>20</sup> Aristoxenus recognised, nevertheless, that certain specific locations for these moveable notes were more familiar than others, and that the forms of tetrachord produced when they were in these positions deserved the theorist's special attention.<sup>21</sup> He recognised two such principal forms of the diatonic. In the commoner of them, the 'tense' diatonic, the intervals within the tetrachord, from the bottom upwards (measured in tones), are  $\frac{1}{2}$ , 1, 1. In the 'soft' diatonic they are  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $1\frac{1}{4}$  (El. Harm. 51.22–31). In the tense diatonic (the version that Nicomachus had in mind) the pitches of paranētē synēmmenon and trite diezeugmenon coincide, the former being separated from mese by the first two steps of its tetrachord,  $\frac{1}{2}$ , 1, the latter by the tone of disjunction and the first step of the tetrachord diezeugmenon,  $1, \frac{1}{2}$ . In the soft diatonic they do not. Trite diezeugmenon is still a tone and a half above mesē, but paranētē synēmmenōn has moved downwards through a quarter-tone. Nevertheless the author of our passage, on my reading of it, is right. If we consider the whole range of the note trite diezeugmenon, regardless of genus, we find that it covers exactly the span of a quarter-tone.<sup>22</sup> It is at the top of its range in diatonic, at the bottom in enharmonic, where it lies a quarter-tone above paramesē,  $1\frac{1}{4}$  tones above mesē. Diatonic paranētē synēmmenōn, according to the Aristoxenian analysis, occupies exactly the same range, since there can be no paranētē higher in the tetrachord than that of the tense diatonic, and no paranētē lower than that of the soft diatonic will count as diatonic.<sup>23</sup> The number of subtly distinct

<sup>&</sup>lt;sup>19</sup> I should emphasize that the theoretical apparatus required is specifically Aristoxenian, not shared by theorists in general. Though many of the conceptions involved are indeed common to writers of all schools, the quantifications given below, on which the detailed interpretation of the passage depends, are specific to Aristoxenus and his followers.

See especially the long discussion at El. Harm. 22.24–27.14.

<sup>&</sup>lt;sup>21</sup> These divisions of the tetrachord are έξαίρετοί τε καὶ γνώριμοι, El. Harm. 50.19–22.

<sup>&</sup>lt;sup>22</sup> It is identical with the range of parhypatē, the corresponding note in the tetrachord mesōn: this is specified at El. Harm. 23.25-6.

Diatonic tetrachords include all those in which the two lowest intervals are jointly equal to or greater than the highest interval. Where this is not the case the pair of intervals at the

diatonic paranētai synēmmenōn there can be, and the number of distinct tritai diezeugmenōn, is potentially infinite,  $^{24}$  since their trajectory through their range is continuous  $(\sigma vv \in \chi \acute{e}s)$ ; but wherever there can be a note in the one category there can be a note in the other. The pitch of a diatonic paranētē synēmmenōn is always available for a tritē diezeugmenōn, and conversely. The fit between Aristoxenian theory and the rather esoteric statement we have reconstructed is exact, and the complexities involved must substantially reduce the chances that the match is a mere coincidence. It seems legitimate to claim that the reconstruction is not just possible, but probable.

Finally we meet the reference in line 13 to the enharmonic and (probably) the chromatic genus. I have already discussed this briefly: the core of my conjecture is that the author is contrasting their case with that of the diatonic. I would therefore guess at something of the following sort for lines 12-14:  $\dot{\epsilon}\nu \delta \dot{\epsilon} \tau \dot{\omega} / \chi \rho \omega \mu a \tau \iota \kappa \dot{\omega} \kappa a \dot{\epsilon} \nu a \rho \mu o \nu \iota \dot{\omega} / \delta \dot{\epsilon} \tau \iota \nu o \dot{\nu} \tau \omega s$ ,  $\dot{a} \lambda \lambda \dot{a} \delta \dot{\epsilon} \hat{\iota} \ldots$  If this is roughly right, the point is readily understood, since the proposition stated above, that paranētē synēmmenōn and tritē diezeugmenōn inhabit the same range, is not true when the paranētē is chromatic or enharmonic. Presumably the author went on to explain by what devices a comparable 'mixture' or 'modulation' might be achieved in these cases, and it is a great pity that his account has been lost.

Let us now take stock, and ask whether the passage, as I have interpreted it, has any independent significance for our understanding of Greek harmonics or adds up to no more than repetitions of familiar doctrine. Haslam, in his prefatory remarks, comments that the work 'was no elementary one', and he is evidently right: it involves complications of a distinctly rarified sort. I want to suggest that there are two respects in which it points to developments of Aristoxenian thought beyond anything found in existing treatises, even though it provides us with no new 'facts' about Greek harmonic structures. The first point is simple. Though several authors, as I have said, regard the shift between conjunct and disjunct systems as an important and musically very acceptable form of modulation, none of them indicates a contrast between the ways it can be handled in diatonic and in the other two genera. They allude only to features that such modulations share in all genera: they involve a modulation or transposition through the interval of a tone, or, in the analysis of Ptolemy, they amount to modulation to a tonos at the interval of a fourth from the original.<sup>26</sup> Only the present author seems to focus on the fact that in diatonic, and there alone, the modulation can always be made to pivot on a single pitch, whose character or melodic function is transformed in the passage of the melody from one system to the other. If we identify mesē with the modern note A, for example, and consider the brief melodic sequence ABCBbA, the first two notes are mesē and paramesē (the lowest note of the tetrachord diezeugmenon), and the last two are trite synemmenon and mesē, where mesē is now treated as the lowest note of the tetrachord synēmmenōn. A transition between tetrachords has taken place, pivoting on the note C, which in its

bottom constitutes what is called a  $\pi \nu \kappa \nu \acute{o}\nu$ , which is characteristic of chromatic and enharmonic divisions. See e.g. El. Harm. 24.11–14, 25.6–9: the distinction is consistently maintained in Aristoxenus and all subsequent theorists.

<sup>&</sup>lt;sup>24</sup> Compare what is said of the note lichanos at El. Harm. 26.13–18.

<sup>&</sup>lt;sup>25</sup> The interval from  $mes\bar{e}$  to  $trit\bar{e}$  diezeugmen $\bar{o}n$  varies between  $1\frac{1}{2}$  and  $1\frac{1}{4}$  tones, as we have seen.  $Paran\bar{e}t\bar{e}$  syn $\bar{e}mmen\bar{o}n$ , however, can be a mere  $\frac{1}{2}$  tone above  $mes\bar{e}$  in enharmonic and  $\frac{2}{3}$  tone in chromatic. Even the highest chromatic version of the note must inevitably be less than  $1\frac{1}{4}$  tones above  $mes\bar{e}$ , since at that point the highest interval in the tetrachord becomes equal to the combination of the two lower intervals, and the division must be diatonic (see n. 23 above).

<sup>&</sup>lt;sup>26</sup> For both aspects of the matter see Ptol. Harm. II.6: cf. Cleonides, Eisagoge 205.5–206.2.

initial context must be *tritē* diezeugmenōn (the 'higher' tritē), but in retrospect, in the light of the subsequent B<sup>b</sup>, functions also as paranētē synēmmenōn. Here we have an instance in which modulation takes place within a single note, rather than in the transition between one note and the next: the note is complex or ambiguous in its melodic function. In chromatic and enharmonic the composer cannot draw on the strategy of 'ambiguating' a corresponding note in this way.

This brings me to my second and last reflection on the passage's general significance. Most authors who discuss modulation between sequences in these two tetrachords do so in a severely theoretical context. In Ptolemy the discussion is embedded in a dispute about the putative independence of two allegedly 'complete' theoretical systems. In Cleonides and Bacchius it appears only in a summary list of types of modulation. The exception is Aristides Quintilianus: in his treatment (29.12-14) the reference occurs in a brief discussion of melodic composition (μελοποιία), which emphasizes the role of this kind of transition in the practical procedures of composers. He adds, however, as a kind of parenthesis, that this same phenomenon  $\kappa \dot{\alpha} \nu \tau \alpha \hat{i} s \mu \epsilon \tau \alpha \beta o \lambda \alpha \hat{i} s \theta \epsilon \omega \rho \epsilon \hat{i} \tau \alpha i$ , meaning that remarks about it are also found among purely abstract treatments of modulation. The unusual feature of the Oxyrhynchus author's approach is that it seems to offer a fusion of the two strategies gestured at by Aristides. While introducing the subject in the 'practical' context of μελοποιία it nevertheless handles it in a closely technical manner, with recourse to quite specialised levels of theoretical doctrine. This suggests a much closer and technically harder-edged attempt at the analysis of compositional manoeuvres than is found in any of the surviving treatises.

We know that  $\mu \epsilon \lambda o \pi o \iota i a$  was included by Aristoxenus, in the second version of his treatise on harmonics, as the final topic with which the science should concern itself.<sup>27</sup> But his discussion of the subject is lost, and the treatments offered by later writers in the Aristoxenian tradition are cursory and only fitfully illuminating. The Oxyrhynchus fragment at least does something to encourage the belief that fuller investigations were sometimes attempted; and in view of the close correspondence between its statements and the minutiae of Aristoxenian doctrine that we have noted, there is no doubt that it belongs squarely in that tradition, whether the words are those of Aristoxenus himself or of a later disciple. The hypothesis that it occupied itself, at least in passing, with the shapes of actual melodies, is suggested by the fairly certain occurrence of the expression  $\mu\epsilon\iota\kappa\tau\dot{\eta}$   $\mu\epsilon\lambda o\pi o\iota\dot{\alpha}$ , and there may possibly be a hint of recommendations about compositional strategy, given the context, in the broken phrase  $\dot{a}\lambda\lambda\dot{a}$   $\delta\epsilon\hat{i}$ ... at the end of the part we have been studying. A genuine focus on heard melodies, not just on the unheard phantasms of theory, might also do something to explain the traces in line 3 of the letters  $\epsilon \lambda \epsilon \lambda \iota \zeta o$ . If these are rightly read, they can hardly represent anything but part of the verb  $\dot{\epsilon}\lambda\epsilon\lambda i \zeta\epsilon\iota\nu$ , which is unknown in the context of harmonic theory. Conceivably it came from a quotation from a poetmusician of the past. One is unavoidably reminded of the evocation of the 'golden phorminx' in Pindar's first Pythian, άγησιχόρων ὁπόταν προοιμίων / ἀμβολὰς  $\tau \epsilon \dot{\nu} \chi \eta s$  έλελιζομένα (Pyth. 1.4), but this may be misleading: perhaps the verb here is not LSJ's  $\dot{\epsilon}\lambda\epsilon\lambda\dot{i}\zeta\omega$  (A), to whirl or set vibrating, but  $\dot{\epsilon}\lambda\epsilon\lambda\dot{i}\zeta\omega$  (B), used in the middle voice by Euripides and Aristophanes to designate the trilling of the nightingale (Helen 1111, Birds 213). At any rate, given the sequel, it seems likely to have served as a vivid description of the 'whirlings' or 'warblings' of a melody that runs up and down through a modulating pattern, transforming itself at every turn. So colourful an

<sup>&</sup>lt;sup>27</sup> See El. Harm. 38.17–18 with 34.34. Many later authors include  $\mu \epsilon \lambda o \pi o \iota i \alpha$  in their lists of the 'parts' of harmonics. But contrast El. Harm. 1.22–2.7.

evocation points to the author's record of a sensitive aesthetic response to the contours of an actual melody or melodies, where the grounds for this response are elucidated through the technical analysis to which the melodic forms are subsequently subjected. It has often been suggested that Greek harmonic theory in general had little connection with the facts of contemporary musical experience, and no doubt the present fragment is too small and its interpretation too uncertain to prove the contrary. But if my reading is anywhere near the mark there was at least one Aristoxenian, whether Aristoxenus himself or an intelligent and imaginative disciple, for whom harmonic theory could give insights into the workings of real music, and was not merely a dusty concatenation of abstract propositions.

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# THE OXYRHYNCHUS MUSICAL MONODY AND SOME ANCIENT FERTILITY SUPERSTITIONS.\*

Ι

Oxyrhynchus papyrus 2436 (XXV, 1959)<sup>1</sup> is of special interest as being the most recent addition to the small corpus of musical papyri, but I propose to discuss the nature of the text, which I give here with the supplements of the *editio princeps*, which should be consulted for alternatives to the letters of doubtful reading.

[..]ιονα. τα[.....]η..η ψαύω δὲ λ[
[·]· ὁ δὲ μο[.].[..]νι[..]αις \*Αρεως Ύμησ[σ Πριά-]
μου μᾶλλον ηὐτέκνησ' ἐγώ σπευσο[
ἀπαλλα[γὴν τ]ῶν κακῶν χορεύσατε· .[
καὶ μὴ [..].[.]μάθητε μνημονεύσατ[ε·
εἴ τις κατὰ στέγας πυρσὸς ἔτι λείπεται, πυρί, παῖ[δες
λάσσεται· ἤν, π[α]ῖδες αἰπόλων καὶ νέας ο[
πης ποι[μένε]ς βουκόλοι μαινάδες δρ [

Although it is unlikely that the subject matter, let alone the period or genre of composition,<sup>2</sup> can be identified with certainty from so short and mutilated a fragment, one important clue

- \* Parts I and III of this article are concerned with the monody, part II with superstitions about fertilising water.
  - <sup>1</sup> Now = Frag. adesp. 1024 in Page, Poetae Melici Graeci.
- <sup>2</sup> Professor Turner suggests three possibilities: (1) a Hellenistic or Roman music-hall scena; (2) a late classical or Hellenistic dithyramb; (3) a pre-Hellenistic lyric, possibly from a satyr-play. Since this article was written, Gentili (Gnomon, XXXIII [1961], p. 341) has attributed the monody to the Meleager of Euripides. But εί τις . . . πυρσός seems an unlikely reference to the specific and unique fire-brand of this legend.

has been missed by the editors—that is, if they are right in thinking that  $\Upsilon \mu \eta \sigma$  of line 2 must represent some part of  $\Upsilon \mu \eta \sigma \sigma \delta$ , the only alternative being  $\Upsilon \mu \dot{\eta} \nu$ . I suggest that the close conjunction of a reference to Mount Hymettus, to which the pastoral catalogue of lines 7-8 is appropriate, and the verb  $\epsilon \dot{\nu} \tau \epsilon \kappa \nu \epsilon \dot{\nu} \nu$  of line 3 points most strikingly to the Attic fountain and shrine usually named  $K \nu \lambda \lambda \delta \nu$   $\Pi \dot{\eta} \rho a$  (where now stands the well-known Byzantine church of Kaisariani), which is variously described in the lexica and paroemiographers  $^3$  with references to lost plays of Cratinus and Aristophanes.

The note in Suidas s. v. Κυλλοῦ Πήραν reads as follows:

Ή Πήρα χωρίον πρὸς τῷ Ὑμηττῷ ἐν ῷ ἱερὸν ᾿Αφροδίτης καὶ κρήνη, ἐξ ἦς αἱ πιοῦσαι εὐτοκοῦσι καὶ αἱ ἄγονοι γόνιμοι γίνονται. Κρατῖνος δὲ ἐν Μαλθακοῖς Καλλίαν (Photius Καλιὰν) αὐτήν φησιν· οἱ δὲ Κυλλουπήραν (Photius Κολλοπήραν). τάττεται δὲ ἡ παροιμία ἐπὶ τῶν τὴν φύσιν βιαζομένων ἐξ ἐπιτεχνήσεως.

Suidas s. v. Κυλλός has a similar wording:

. . . ἔστι δὲ καὶ κρήνη ἀφ' ῆς τὰς στερίφας πίνειν γυναῖκας ἵνα συλλαμβάνωσι.

Hesychius reads:

ζητοῦσι διὰ τί τὸ πορνεῖον Κύλλου Πήραν 'Αριστοφάνης εἴρηκεν ἐν Δράμασιν ἢ Κενταύρω· τὸ δὲ πορνεῖον Κύλλου Πήρα. ἔστι γὰρ χωρίον 'Αθήνησι ἐπηρεφὲς καὶ κρήνη. ἀντὶ δὲ τοῦ πέραν πήραν ἔφη.

The origin and meaning of the name of the spring are obscure. If the spelling  $K\dot{\nu}\lambda\lambda\rho\nu$   $\pi\dot{\eta}\rho a$  is original, 'the beggar's wallet' might have derived its name from the shape of a cave or grotto at the site which was used as a shrine, and in this

<sup>3</sup> Suid., svv. Κυλλός, Κυλλοῦ Πήραν; Phot., svv. Κιλλεία, Κύλλου Πήραν; Hsych., svv. Κίλλεια, Κύλλου Πήρα; Macar., V, 41; App. Prov., III, 52.

<sup>4</sup> The likeness would be enhanced if food offerings, etc., were habitually placed there (cf. Od., XVII, 210-1), or alms asked and received. Cf. Ar., Eq., 1083 and Schol. on the phrase ξμβαλε κυλλῆ (sc. χειρί). This is the explanation of the name Κύλλου πήρα given by Demon ap. Zenobius, II, 37 Miller: αὕτη παραπλησία ἐστὶ τῆ Ἐμβάλλεται εἰς Κύλλην, ἐπεὶ καὶ οἱ αἰτοῦντες τὴν χεῖρα οὕτω σχηματίζουσι. For collections on behalf of nymphs of hill and spring who are also patronesses of childbirth, cf. Aesch., Fr. 168 and Nilsson in Ant. Class., XXIV (1955), pp. 336-40. The Corycian cave on Parnassus is similarly derived from κώρυκος, a wallet, and was a place of worship of nymphs and Pan. (Cf. Soph., Ant., 1128; Aesch., Eum., 22; Paus., X, 32, 5; C. I. G., 1728). For another Corycian cave see Paus., X, 12, 7.

connection it is of interest that in line 6 of the new papyrus the apparent reading is  $\kappa a \tau \hat{\alpha} \sigma \pi \gamma a s$ , which requires emendation (quite apart from the doubtful letters) to either  $\sigma \tau \hat{\epsilon} \gamma a s$  (preferred by the editors) or  $\sigma \pi \hat{\epsilon} o s$ , and for the latter we may compare Hesychius' description of the place as  $\chi \omega \rho \hat{\iota} o \nu \hat{\epsilon} \pi \eta \rho \epsilon \phi \hat{\epsilon} s$   $\kappa a \hat{\iota} \kappa \rho \hat{\eta} \nu \eta$  with  $\sigma \pi \hat{\epsilon} o s \kappa a \tau \eta \rho \epsilon \phi \hat{\epsilon} s$  of the cave of the nymphs in Od., XIII, 349,  $\sigma \pi \hat{\epsilon} o s \hat{\epsilon} \pi \eta \rho \epsilon \phi \hat{\epsilon} s$  in Ap. Rhod., II, 736, and the whole description of the nymphs' cave in Longus, I, 4. But in view of the spelling  $\kappa a \lambda(\lambda) \hat{\iota} a$  attributed to Cratinus, there are reasonable grounds for associating the name with  $\kappa a \lambda \hat{\iota} a$  or  $\kappa a \lambda \hat{\iota} a s$ , a grotto or shrine. Aphrodite was actually worshipped under the name  $\kappa a \lambda \hat{\iota} a s$  in Samothrace, and Pausanias (X, 38, 13) says she was worshipped in Naupactus  $\hat{\epsilon} \nu \sigma \pi \eta \lambda a \hat{\iota} \omega$ , in particular by widows desiring husbands.

Whether Aristophanes was justified in calling this Aphrodite shrine on Hymettus nothing better than a  $\pi o \rho \nu \epsilon \tilde{i} o \nu$  we cannot say. (The case of Acrocorinth immediately suggests a parallel, and Aphrodite was worshipped in Athens itself as  $\epsilon \tau a l \rho a$  and at Abydos as  $\pi \delta \rho \nu \eta$ .) We are ignorant also of the circumstances of its mention in Cratinus, although the name of the play Malthakoi is suggestive. The only other reference, more or less explicit, to the place in classical literature (its omission in Pausanias is a little surprising in view of its topographical and antiquarian interest) is in Ovid, Ars Am., III, 687 ff. in the story of Cephalus and Procris:

est prope purpureos colles florentis Hymetti fons sacer, et viridi caespite mollis humus...

<sup>&</sup>lt;sup>5</sup> I. G., XII, 8, 233 (3rd c. B. C.). For Kaλίa also in Lesbos, see Tumpel in *Philol.*, N. F., III (1890), pp. 726, 735. For Aphrodite of the Zerynthian cave, see below, p. 239.

<sup>&</sup>lt;sup>6</sup> For other examples of worship of gods in grottoes cf. Paus., X, 32, 5 on  $\Sigma\pi\eta\lambda\ddot{a}i\tau a\iota$ . The  $\sigma\pi\acute{e}os$   $Ei\lambda\epsilon\iota\theta\nu\acute{\iota}\eta s$  at Amnisus (Od., XIX, 188), on which see Willetts, Cretan Eileithyia in C. Q., N. S., VIII (1958), pp. 221 ff., again associates caves and childbirth. Cf. also St. Byz., svv. 'Αμνισόs, Είνατος (Είνατίη = Ilithyia, Callim., Fr. 524 Pfeiffer); Callim., Dian., 15 ff.

<sup>&</sup>lt;sup>7</sup> Paus., II, 5,1; Pind., Fr. 107 Bowra; Eur., Fr. 1084; Strabo, VIII, 378.

<sup>&</sup>lt;sup>8</sup> Athen., 571c; Hsych. ἐταίρας ἰερόν. Athenian prostitutes also established an Aphrodite shrine in Samos (Athen., 572 f).

<sup>&</sup>lt;sup>9</sup> Athen., 572e.

I can see, however, nothing in this famous legend which suggests that Ovid's identification of its locality with the Kyllupera of Cratinus and Aristophanes has any special significance, or has any bearing on the theme of the new fragment.<sup>10</sup>

The words ηὐτέκνησ' ἐγώ of line 3 show that the subject matter is the production of a child or children (as opposed to infertility) rather than easy labour (where εὐτοκεῖν rather than εὐτεκνεῖν would have been used); wherefore, if the reference to Hymettus and Kyllupera be admitted, it is with the second part of the note in Photius/Suidas, ai ἄγονοι γόνιμοι γίνονται, that we are concerned. The theme of childlessness and its remedy is not unknown to early Attic mythology—the stories of Aegeus, or Xuthus and Creusa,<sup>11</sup> for example, come to mind, and according to Pausanias (I, 14, 7) it was to Aphrodite Urania that Aegeus turned, αὐτῷ τε οὐκ εἶναι παῖδας νομίζων . . . ἐκ μηνίματος Οὐρανίας. Now of all the forms of Aphrodite, Urania is most closely associated with sexual love and fertility, being identifiable with the Semitic Astarte.<sup>12</sup> Pindar's poem <sup>13</sup> celebrating the courtesans of Acrocorinth calls her ματέρ' ἐρώτων οὐρανίαν, and although the shrine said to have been established by Aegeus was in the city, 14

10 That the Aristophanes reference is from a play called Kentauros, however, presents a curious coincidence. The parents of this prototype of the Centaurs were Ixion and Nephele (the cloud phantom in the shape of Hera) to which legend, first in Pindar, Pyth., 2, 36 ff., Ar. himself may allude in Nub., 346 νεφέλην Κενταύρω ὁμοίαν, and the name was popularly derived from Ixion's impregnation of the cloud or air (Et. Mag., 503, 50 ἀπὸ τοῦ τὸν πατέρα αὐτοῦ Ἰξίονα κεντεῖν τὴν αὔραν. Cf. Schol. Luc., Pisc., 12). Now in the story of Procris' death on Hymettus it was Cephalus' repeated call ὧ Νεφέλη παραγενοῦ which aroused her suspicions of a liaison (Pherecydes ap. Schol. Od., XI, 321), whereas Ovid says it was Aura on whom he called (Met., VII, 810 ff.; Ars Am., III, 698 ff.). But there may be nothing in this. For the derivation of Kentauros see Sturtevant in C. P., XXI (1926), pp. 235 ff.

<sup>11</sup> Cf. the prayer for εὐτεκνία in Eur., Ion, 452 ff. This is a standard motif also in epithalamia: Theoc., 18, 50-1; Aesch., Fr. 43; Ar., Pax, 1325; Page, Select Literary Papyri (Loeb), No. 139, p. 560. Cf. Eur., fr. 773, 72.

<sup>&</sup>lt;sup>12</sup> Notice also the connection with Ilithyia: Aphrodite Urania is the eldest of the Moirai (Paus., I, 19,2), who are frequently associated with the birth goddess (Pind., Ol., 6, 42; Nem., 7,1; Plato, Symp., 206D; Paus., VIII, 21,3; Anton. Lib., 29).

<sup>&</sup>lt;sup>13</sup> Fr. 107 Bowra.

<sup>&</sup>lt;sup>14</sup> Paus., loc. cit. But Frazer in his note on the shrine of Aphrodite

in the district called the Gardens, on the banks of the Ilissus (which river has as one of its sources the spring at Kaisariani, and as I shall show has many associations with rites of marriage and fertility), there was another temple of Aphrodite Urania with a statue of the crude square stone type denoting fertility like the familiar Hermae. According to Artemidorus (Onirocr., II, 37) Aphrodite Urania was μάλιστα ἀγαθὴ περὶ γάμους καὶ κοινωνίας καὶ πρὸς τέκνων γονήν.

To return to the new fragment, although it is a long shot, a possible clue to the subject is suggested by an odd coincidence in a fragmentary commentary on Callimachus' Aetia (Pfeiffer, II, Addenda, 2a). In lines 49 ff. there is first a reference to Hymettus in connection with the Muses (for which Pfeiffer has no solution to suggest), and then in 61-2 the words ἐγκόλπιος and γόνω, both appropriate to a context treating fertility and childbirth. It seems possible that there was a local Attic legend which patriotically identified the Muses, their cult and perhaps even their birth, with Hymettus instead of the traditional Helicon. 16 A fragment of the Movσων γοναί of the comic poet Polyzelus apparently referred to Hymettus, to judge from the entry in Et. Mag., 352, 50 s. v. Έπάκριος Ζεύς· ἐπ' ἄκρας γὰρ τῶν όρων ίδρύοντο βωμούς τῷ Διί, οἶον τοῦ Ύμηττοῦ, τοῦ Παρνήθου. Πολύζηλος Μουσων γοναίς " ίερον γαρ ον τετύχηκας Έπακρίου Διός" (= Fr. 7 K.). Fr. 8 of the same play (ωσπερ Χαλκιδική τέτοκεν ἡμῖν ἡ γυνή) compares the mother of the Muses to Chalcis (= Combe, mother of the Curetes), who according to Zenobius (VI, 50), who cites the line, was proverbial for multiple progeny (. . . ἐπί τινος πολλὰς θυγατέρας ἀπογεννώσης). In his note ad loc.

Urania in the Gardens (Commentary on Pausanias, I, 19,2) gives reasons for supposing that this was the sanctuary originally associated with Aegeus.

<sup>15</sup> Cf. the unwrought stone image of Eros at Thespiae (Paus., IX, 27, 1).

16 In this connection note that according to the atthidographer Cleidemus (Fr. 1) the name Helicon was given to the Agrae district of Athens on the western bank of the Ilissus. For worship of the Muses at Ilissus see below, p. 230, n. 19. Hymettus could claim also the birth of Apollo in a local legend recorded by Photius, s. v. κύνειος. (Cf. the alleged derivation of the name of Cape Zoster, where the southern slopes of Hymettus run towards the sea, given by Paus., I, 31, 1, Hyp., fr. 67, St. Byz., s. v.  $Z\omega\sigma\tau\eta\rho$ , etc., that it was here that Leto loosened her girdle.)

Kock assumes that the comparison in Polyzelus' line implies a tradition of seven muses here, but it seems more likely that ισσπερ should not be interpreted so closely, and that the birth of nine muses is compared to the seven of επτάτοκοs Combe (cf. Nonnus, XIII, 147 and Meineke's επτά for εκατόν in Zenobius, loc. cit.). This bears a marked similarity to μᾶλλον ηὐτέκνησ' εγώ of the new papyrus—whoever are the persons compared in this context.

Although Mnemosyne is usually the mother of the Muses in ancient literature, a controversial passage of the Medea (830 ff.) seems to point to Harmonia, in a version which also assigns their birthplace to Attica, ἔνθα ποθ' ἀγνὰς / ἐννέα Πιερίδας Μούσας  $\lambda \epsilon \gamma o v \sigma i / \xi a v \theta a v \Delta \rho \mu o v \alpha v \sigma v \sigma a v$ . (I cannot believe that this means the opposite—that the Muses 'gave birth to music' in a metaphorical sense, although the controversy as to what is the subject and what the object of overevous is at least as old as the scholia, q. v.) As Harmonia was a daughter of Ares, the probable occurrence of  $\pi$  as "Apews in the second line of the papyrus is at first sight promising, but I do not see how to handle this, 17 and the 'child of Ares' who otherwise appears most appropriate to the context is Eros.<sup>18</sup> Although there is no specific evidence of Eros worship by the Ilissus (as there is of the Muses 19) the setting of Plato's Phaedrus and the discussion of Love there suggest him as a suitable companion for Aphrodite and the Muses or nymphs here as elsewhere. He had an altar (as old as Pisistratean times) in the Academy, 20 and in this connection it is an interesting parallel that in the famous Colonus ode of Sophocles (O. C., 685 ff.) the river Cephisus is called ἀκυτοκός and its

17 Cf. Eur., Bacch., 1356. Indeed 'Aρμο]νί[a happens to fit exactly the space before  $\pi$ ]αις, but does not relate to δ δè μο[ which appears to begin the sentence. Nonnus (V, 191) refers to Harmonia's πολύπαιδα γονήν (not of course the Muses here). She appears in a prayer for children in the anonymous Epithalamion in Page, loc. cit.

18 The restoration in the fragment will presumably take the form of an epithet, e. g. μουσομανής, or perhaps μ' οὐράνιος, assuming a verb such as ἀφελεῖν, σώζειν. For what the parallels are worth, cf. Lucian, Am., 32, 37; C. I. G., 3157 (from Smyrna) which combines Eros οὐράνιος and Aphrodite οὐρανία. (For this account of Eros' parentage—much diversified—cf. Simon., fr. 43; Cic., De Nat. Deor., III, 60.)

<sup>19</sup> Paus., I, 19,5; St. Byz., s. v. Ἰλισσόs. Cf. Himerius, Or., 22,9. For the cult of Eros in Athens see Broneer in Hesperia, I (1932), pp. 49 ff. <sup>20</sup> Paus., I, 30,1; Athen., 609d.

association with Aphrodite and the Muses stressed. In the closely parallel *Medea* ode mentioned before, the Cephisus is named (and the Ilissus implied, cf. ἱερῶν ποταμῶν, 846), and through their connection with εὐτεκνία the reference is grimly ironical in view of the killing of her children by Medea which it foreshadows.<sup>21</sup>

#### II

A belief in the fertilising powers of certain waters both for animals and women was widespread in the ancient world—aquae quaedam haustae fecunditatem adferunt, says Seneca (Nat., III, 2); and the deities and nymphs who preside over the rivers or springs and who, like them, are κουροτρόφοι,<sup>22</sup> naturally have to be propitiated. Artemidorus (Onirocr., II, 38) says that in general dreams about ποταμοὶ καὶ λίμναι καὶ Νύμφαι (αὶ ἐφυδριάδες) ἀγαθοὶ πρὸς παίδων γονήν, and again (ibid., II, 27) οὐδὲν γὰρ οὖτω τρόφιμον ὡς ὕδωρ. But it is worthwhile recording a few specific parallels to the belief about Kyllupera on Hymettus.

Most famous are the γονιμώδεα λουτρά <sup>23</sup> of Egypt and particularly the Nile. <sup>24</sup> Aelian (N. A., III, 33) writing about multiple births of Egyptian goats says λέγεται ὁ Νεῖλος αἴτιος εἶναι εὐτεκνότατον παρέχων ὕδωρ, and Strabo (XV, 695) says the same of women: καὶ Νεῖλον δὲ εἶναι γόνιμον μᾶλλον ἐτέρων καὶ μεγαλοφυῆ γεννᾶν· τάς τε γυναῖκας ἔσθ' ὅτε καὶ τετράδυμα τίκτειν τὰς Αἰγυπτίας. He then quotes Aristotle (= fr. 284 Rose) on the same topic. This belief may explain an interesting anecdote in Polybius

<sup>&</sup>lt;sup>21</sup> It might be added that the whole 'irrelevant' Aegeus episode is enhanced by a certain piquancy in that he is earnestly seeking to beget children at the moment when Medea is bent on destroying hers.

<sup>&</sup>lt;sup>22</sup> Hes., Theog., 346-7; Eur., El., 626; [Aeschin.], Ep. 10; and (with special reference to hair offerings) Aesch., Cho., 6; Schol. Il., XIV, 246 and XXIII, 142; Eust., 1293, 3; Paus., I, 37, 3 (Cephisus). According to Philostr., Her., 13, 4, Ajax grew his hair in honour of the Ilissus. On the whole subject see F. G. Ballentine, "Some Phases of the Cult of the Nymphs," H. S. C. P., XV (1904), pp. 77 ff.

<sup>&</sup>lt;sup>28</sup> Orph. H., 55, 19.

(fr. 73 ap. Athen., 45c) that when Ptolemy Philadelphus obliged Antiochus II of Syria to marry his daughter Berenice he sent her consignments of Nile water so that she should drink nothing else. As he hoped that she would provide an heir to the Syrian throne, the traditional efficacy of the water may have inspired this curious act, and moreover, according to the scholiast on Aesch., Suppl., 858, Nile water was especially favourable to the conception of male children.<sup>25</sup>

In the Supplices itself the generative power of Nile water 26 is an important motif. At line 854 the chorus pray that they may not see again the ἀλφεσίβοιον ὕδωρ / ἔνθεν ἀεξόμενον / ζώφυτον αἷμα βροτοῖσι θάλλει (where, as Tucker remarks in his note ad loc., the Danaids are unwilling to succumb and "become prolific mothers of children to the lusty sons of Aegyptus.") Yet in the concluding chorus (1018 ff.), after again rejecting hymns in honour of the Nile, they praise instead the local Argive rivers 27 οἳ διὰ χώρας / θελεμὸν πῶμα χέουσιν πολύτεκνοι (schol. πολυτεκνίας πρόξενοι) / λιπαροῖς χεύμασι γαίας / τόδε μειλίσσοντες οὖδας. The conflicting opinions expressed in this scene about marriage and procreation have impelled some scholars to redistribute the lines in various ways or to invoke modern psychology to explain the ambivalence of their attitude, but it should be remembered that Aeschylus was aware of a tradition not only that the rivers of Argos were conducive to πολυτεκνία but that certain of the Danaids themselves 28 were the nymphs of these springs and indeed patronesses of marriage and childbirth. This has been recently illuminated by the papyrus find of lines which correct and supplement Aesch., fr. 168 N2, formerly assigned to the Xantriae but now more plausibly to the Semele,29 where Hera

<sup>&</sup>lt;sup>25</sup> ἀρρενογόνον γὰρ τὸ ὕδωρ τοῦ Νείλου ὅθεν Ζεὺς πιὼν ἔτεκεν Ἦρεα. A similar belief (as regards animals) is recorded of the Achaean river Charadrus by Pausanias (VII, 22, 11).

<sup>&</sup>lt;sup>26</sup> In the *Persae* also (line 33) Aeschylus calls the Nile  $\pi$ ολυθρέμμων, which certainly refers to human procreation here.

<sup>&</sup>lt;sup>27</sup> Cf. their prayer in 691-2 for fertility in cattle also.

<sup>&</sup>lt;sup>28</sup> Hippe, Automate, Amymone, Physadeia. Cf. Callim., frs. 65-6 Pfeiffer. Another Danaid, Polydora, is said to have been married to the river-god Spercheios (Ant. Lib., 32) or Peneios (Schol. Ap. Rhod., I. 1212).

<sup>&</sup>lt;sup>29</sup> See Lloyd-Jones in Appendix to vol. II of Aeschylus in the Loeb Classical Library (reprinted 1957), pp. 566-71 and the extensive litera-

in disguise is collecting offerings for "the life-giving children of Inachus the river of Argos" of whom it is said (lines 25-6) παίδων δ' εὐκαρπον τελέθει γένος, οἶσιν ἐκεῖναι / ἴλαοι ἀντιάσουσι μελί-φ[ρονα θυμὸν ἔχουσαι. It may well be that the πολυτεκνία motif of the Supplices and subsequent patronage of the Argive rivers by the Danaids were expounded in the remainder of the Danaid trilogy, and the satyr-play Amymone.

The use of the word  $\mathring{a}\lambda\phi\epsilon\sigma\mathring{i}\beta\sigma\iota\sigma^{30}$  of the Nile water in the passage quoted above has suggested to me a similar explanation of the name Larine given to an unidentified spring in Attica by Pliny (N. H., IV, 24) where its position in the list Cephisia, Larine, Callirroe, Enneacrunus suggests that it might be another name for the classical Kyllupera, as so notable a spring is unlikely to have been passed over. The classical Kyllupera of the place-name Larine in Epirus in Athen., 376b. A similar derivation of the name Larine in Epirus in Athen., 376b. A similar derivation of the name Larisa is given by Schol. Ar., Av., 465 (on  $\lambda a \rho \iota \nu \partial \nu \tilde{\epsilon} \pi \sigma s$ ):  $\dot{\omega} s \dot{\epsilon} \pi \dot{\epsilon} \rho \delta s \delta \tilde{\epsilon} \tau \sigma \tilde{\nu} \tau \sigma \delta s \dot{\epsilon} \nu \lambda a \rho \dot{\epsilon} \sigma \sigma g \mu \epsilon \gamma a \lambda \tilde{\omega} \nu \beta \sigma \tilde{\omega} \nu \gamma \epsilon \nu \sigma \mu \dot{\epsilon} \nu \nu \nu \sigma \dot{\epsilon} \sigma \tau \iota \delta \tilde{\epsilon} \tau \delta \lambda \iota s$   $\Theta \epsilon \sigma \pi \rho \omega \tau \dot{\epsilon} a s$ .

To revert now to other examples of streams effective for procreation, Theophrastus (Hist. Plant., IX, 18, 10) mentions ὅδωρ παιδόγονον in Thespiae, ἄγονον in Pyrrha, and Pliny (N. H.,

ture there cited. It will be remembered that the Semele had the alternative title Hydrophoroi. It is generally assumed that the chorus bring water 'for the ceremonial washing of the new-born infant' (Dodds, Bacch., intro., p. xxix), but such a situation seems improbable for the beginning of the play, and before even the fatal temptation of Semele, whose pregnancy was disastrously terminated well before 'the expected date' (the authorities vary between six and seven months). Might then the water have been brought with a view rather to promoting εὐτοκία?

30 'That yields fat oxen (by enriching pastures),' L.S.J.

<sup>31</sup> I find that this identification was also proposed by Dodwell (*Tour through Greece*, I, p. 488).

32 The etymologies generally accepted connect the ubiquitous 'Pelasgian' Larisa either with Etruscan lar, etc., or Greek λᾶas, λαῦρα, etc. It may be observed that the traditional epithet ἐριβώλαξ applied to Larisa in Homer (Il., II, 841; XVII, 301) is more appropriate to a fertile plain than the stones of an acropolis. For the latest discussion cf. Lochner—Hüttenbach, Die Pelasger, pp. 157 ff. Incidentally Strabo (IX, 440) places a Larisa in Attica which like Pliny's Larine has not been identified—indeed his text, καὶ ἐν τῆ ἀτικῆ δ' ἐστὶ Λάρισα (repeated in St. Byz., s. ν. Λάρισα), has been emended to Καρικῆ. Larisus is also a river name in Achaea (Strabo, VIII, 387, etc.).

XXXI, 10), who also mentions Thespiae, 33 adds Arcadia and Sinuessa (in eadem Campaniae regione Sinuessanae aquae sterilitatem feminarum et virorum insaniam abolere videntur).34 Of interest also because it was associated with a shrine of Aphrodite is the spring at Salmacis near Halicarnassus mentioned by Vitruvius (II, 8, 11) of which it is said molles et inpudicos ex ea aqua fieri. Nonnus (VIII, 115) refers to the λεχώιον ὔδωρ of Amnisus (the birthplace of Ilithyia). Further afield [Plut.], De Fluv., 20, 2 mentions the existence in the Euphrates of a λίθος ἀετίτης useful for δυστοκουσαι and Josephus (Bell. Jud., IV, 8,3) describes the change in nature of a spring near Jericho through the intervention of the prophet Elisha 35—τὸ πρὶν ὀρφανίας αὐτοῖς καὶ λίμου παραίτιον ὕδωρ ἐκ τότε εὐτεκνίας καὶ κόρου χορηγον κατέστη—and he refers also to το των εδάτων ευγονον. Finally Frazer (Golden Bough, II, pp. 159 ff.) cites examples of the belief from regions as diverse as Syria, India, Scotland, and Oxford,<sup>36</sup> and writers on modern Greece <sup>37</sup> report that the belief still persists in the fertilising powers of the spring at Kaisariani, where on the outside east wall of the monastery the water gushes from a marble ram's head—itself a symbol of generative power.38

38 This was the chief centre for the cult of Eros and the Muses (Paus., IX, 27, 1,  $\theta\epsilon\tilde{\omega}\nu$  δè οἰ  $\theta\epsilon\sigma\pi\iota\epsilon\tilde{\iota}s$   $\tau\iota\mu\tilde{\omega}\sigma\iota\nu$  Έρωτα  $\mu\dot{\alpha}\lambda\iota\sigma\tau\alpha$ ; idem, IX, 31,3 for games in honour of Muses and Eros). It is here that Plutarch's dialogue Amatorius has its setting, the introduction to which (749) suggests that the sacrifice made to Eros by Plutarch's wife—καὶ  $\gamma\dot{\alpha}\rho$   $\tilde{\eta}\nu$  ἐκείνης  $\dot{\eta}$  εὐχ $\dot{\eta}$  καὶ  $\theta\nu\sigma\iota\alpha$ —after an estrangement with her husband was connected with her conceiving a child—cf.  $\pi\rho\iota\nu$   $\dot{\eta}\mu\tilde{\alpha}s$   $\gamma\epsilon\nu\dot{\epsilon}\sigma\theta\alpha\iota$ , spoken by his son Autobulus.

<sup>&</sup>lt;sup>34</sup> For Sinuessa cf. also Martial, XI, 82.

<sup>&</sup>lt;sup>85</sup> Cf. 2 Kings, ii, 19.

<sup>&</sup>lt;sup>36</sup> For further examples, see E. S. Hartland, *Primitive Paternity*, I, pp. 64 ff. According to B. Little (*The Building of Bath*, p. 22) Charles II took Catherine of Braganza to Bath in the hope of curing her barrenness.

<sup>&</sup>lt;sup>37</sup> L. Ross, Archäologische Aufsätze, I, pp. 221-2. M. Hamilton (Greek Saints and their Festivals, pp. 151 ff.), writes (in 1910) of the Ascension day festival at Kaisariani, "Up to quite recent times the festival at Kaisariani was very popular among the Athenians, and sick people were brought for cure at the spring. . . . At another branch of the stream nearby women of Athens still go to drink, praying for children." For further comment on the adaptation of the old folk-lore to the changed religious background, see C. Vellay in L'Acropole, IV (1929), pp. 194 ff., and R. Rodd, The Customs and Lore of Modern Greece, p. 94.

<sup>38</sup> See refs. in Cook, Zeus, I, p. 429, n. 4 (especially Pliny, N. H.,

Moreover the fact that the waters of the Ilissus itself <sup>39</sup> were used for ceremonial and purificatory purposes in Athens in connection with marriage (with particular reference to the procreation of children) and childbirth is significant in view of the corresponding belief about the spring from which the river rises. A scholium on Eur., Phoen., 347 (λουτροφόρου χλιδᾶs) runs: εἰώθασι γὰρ οἱ νυμφίοι τὸ πάλαιον ἀπολούεσθαι ἐπὶ τοῖs ἐγχωρίοις ποταμοῖς καὶ περιρραίνεσθαι λαμβάνοντες ὕδωρ τῶν ποτάμων καὶ πηγῶν, συμβολικῶς παιδοποιίαν εὐχόμενοι, ἐπεὶ ζωοποιὸν τὸ ὕδωρ καὶ γόνιμον. This may have been true of the Theban Ismenus also, <sup>40</sup> but it is as likely that Euripides was thinking of Athenian practice, where the water used for the bridal bath was traditionally fetched from the ancient fountain of Callirrhoe, later called Enneacrunus, <sup>41</sup> by the λουτροφόροι. <sup>42</sup> The significance of this lustration is ex-

XX, 6, XXIX, 32, for the use of ram's wool in connection with child-birth and female disorders); *ibid.*, III, 2, p. 1082 (ram's head on Hermes phallos); Eust., 1293, 6, διὸ καὶ ἔνορχα μῆλα ἰέρευον ὥσπερ τῷ Ποσειδῶνι, οὕτω καὶ τοῖς ποταμοῖς εἰς τὰς πηγάς. γόνιμα γὰρ καὶ τὰ ἄρρενα.

<sup>89</sup> Nonnus (XXXIX, 190) calls the Ilissus γαμόστολος, and (XLVII, 13) refers to its ἔμπνοον ὕδωρ.

<sup>40</sup> In his criticism of Jocasta's lament in this passage of the *Phoenissae* Plutarch (Mor., 606 f) seems to be thinking of the no less effective Argive springs which Polyneices in exile had at his disposal. It is interesting that he quotes the previous words οὖτε σοι πυρὸς ἀνῆψα φῶς / γόνιμον ἐν γάμοις (νόμιμον codd. Eur.). Whether this is a misquotation or a scribal error, it is explicable as an anticipation of the notion implicit in the nuptial λουτρόν.

<sup>41</sup> Thuc., II, 15. Pace Pausanias (I, 14, 1) and the discovery of a fountain house in the Agora which has been identified with his Enneacrunus, I find it impossible to disregard the testimony of 5-4th century writers (Hdt., Thuc., Cratinus, Polyzelus, the author of the Platonic Axiochus), and the conclusion drawn in Et. Mag., s. v. Έννεάκρουνος, which point to the fact that Callirrhoe on the Ilissus, south-east of the Acropolis, is the fountain in question. For the passages relating to this, see the testimonia 434-55 in The Athenian Agora, III, and the summing up by Gomme (Historical Commentary on Thuc., II, pp. 53 ff.) and his conclusion "Thucydides must have known, and Pausanias may easily have been misinformed." Homer Thompson (Hesperia, XXV [1956], p. 52) writes "It would therefore seem discreet to regard this venerable problem as still unsettled."

<sup>42</sup> Pollux, III, 43; Harp., s.v. λουτροφόροs, etc. Cf. the λοχευτρίαι of the cult of Hera at Argos, who drew water from the fountain Automate (Adnot. ad Callim., fr. 65 Pfeiffer). This evidence, which connects one of the Argive springs named after a Danaid with a practice so similar

plained, doubtless correctly, by Porphyrius (Antr., 21) in an interpretation of the word Naiades: Natδες οὖν νύμφαι αἱ εἰς γένεσιν ἰοῦσαι ψυχαί. ὅθεν καὶ τὰς γαμουμένας ἔθος ὡς ἄν εἰς γένεσιν συνεζευγμένας νύμφας τε καλεῖν καὶ λουτροῖς καταχεῖν ἐκ πηγῶν ἢ ναμάτων ἢ κρηνῶν ἀενάων εἰλημμένοις. ¹³ The importance of certain springs or rivers for this purpose is further illustrated in the recognition scene of Eur., I. T., 818 where we find that Clytaemnestra actually sent to Iphigeneia for the nuptial bath at Aulis a special delivery of water from Argos!

Just as lustral water from such springs <sup>44</sup> as Callirrhoe was used to induce fertility and solicit the goodwill of the presiding nymphs, and the water of Kyllupera drunk to aid conception or promote easy labour, so were the nymphs invoked as the day of birth approached or thanked when the child was safely delivered. This is well shown in Euripides, El., 624-6 where again the poet doubtless had in mind Athenian practice, although the nymphs in question will be those of the Argive rivers. To Orestes' question "where is Aegisthus?" the old man replies Νύμφαις ἐπόρσυν' ἔροτιν, ὡς ἔδοξέ μοι, whereupon Orestes asks τροφεῖα παίδων ἢ πρὸ μέλλοντος τόκου;

A good example of a votive offering to the Nymphs after a successful delivery is the inscription (B. S. A., XV [1908-9], p. 243)  ${}^{\circ}O_{\rho\epsilon\iota}[\acute{a}\sigma\iota\nu]$   ${}^{\circ}E_{\nu\pi\epsilon\delta\sigma\kappa\lambda\epsilon\acute{a}}\Phi\iota\lambda\sigma\delta\alpha\mu\epsilon\acute{a}$   $\pi\grave{\epsilon}\rho$   $\gamma\epsilon\nu\epsilon\tilde{a}s$ , and near Callirrhoe itself was found the inscription (C. I. A., II, 1590), referring to a dedication by Philumene, wife of Amphimachus, to Ilithyia. Further down the southern slopes of Hymettus is

to that of the Athenian loutrophoroi, lends support to the view that the traditional punishment of the Danaids in Hades, from which Hypermnestra, married to Lynceus, and Amymone, raped by Poseidon, were exempt (cf. Pindar, Pyth., 9,113 with schol.; Lucian, Dial. Mar., 6) is based upon the same symbolism as the loutrophoros vases which, in addition to their use as votive offerings, were represented on the grave monuments of the unmarried. Cf. Eust., 1293, καὶ τοῖς πρὸ γάμου δὲ τελευτῶσιν ἡ λουτροφόρος, φασίν, ἐπετίθετο κάλπις εἰς ἔνδειξιν τοῦ ὅτι ἄλουτος τὰ νυμφικὰ καὶ ἄγονος ἄπεισι. For a virgin loutrophoros in the cult of Aphrodite at Sicyon see Paus., II, 10, 4.

<sup>43</sup> Cf. Buffière, Les Mythes d'Homère, p. 603, n. 10, "Génération et parturition, aux yeux des anciens, comportent une souillure . . . D'où les précautions multiples pour purifier les mariés . . . bains préalables avec invocations des nymphs présidant aux sources où l'eau est puisée, aspersions, fumigations, torches, etc."

<sup>44</sup> For another example see Plut., Mor., 772b (Kissoessa in Boeotia).

the famous cave at Vari, where many inscriptions to Nymphs, Pan, and Apollo and miniature votive *loutrophoros* vases have been found.<sup>45</sup> This cave has been persuasively identified with the place on Hymettus where Plato's parents placed him after birth with sacrifices to the deities of the place (Muses or nymphs, according to Aelian, V. H., X, 21; Pan, nymphs, Apollo Nomios, according to Olympiodorus, Vit. Plat., 1; Apollo Nomios and nymphs, according to Anon. Vit. Plat., 2).<sup>46</sup>

It is remarkable how persistent are the legends and cults pertaining to all manner of deities of childbirth great and small in Attica, ranging from Kyllupera down Hymettus to the coast, and on the coast between Phalerum and Cape Zoster. With the legend of Zoster and its cult of Leto and her children I have dealt above.<sup>47</sup> At Phalerum was found the fourth-century inscription I. G., II,<sup>2</sup>, 4547 with its remarkable collection of birth and river deities ('Εστία, Κηφισῷ, 'Απόλλωνι Πυθίῳ, Λητοῖ, 'Αρτέμιδι Λοχία, 'Ιλειθνία, 'Αχελώῳ, Καλλιρόη, Γεραισταῖς Νύμφαις γενεθλίαις, 'Ραψοῖ), set up by Xenocrateia after the birth of a child.<sup>48</sup>

 $<sup>^{45}</sup>$  A. J. A., VII (1903), pp. 263 ff. (esp. 323-4).

<sup>&</sup>lt;sup>46</sup> Cf. the votive offerings to nymphs of cave and stream for the preservation of children exposed on mountains in Longus, I, 6-8, where Eros is also specified  $(\tau\tilde{\varphi} \ \tau\dot{\alpha} \ \pi\tau\epsilon\rho\dot{\alpha} \ \tilde{\epsilon}\chi o\nu\tau\iota \ \pi a\iota\delta\iota\varphi)$ .

<sup>&</sup>lt;sup>47</sup> See above, note 16.

<sup>&</sup>lt;sup>48</sup> See Cook, Zeus, II, 1, pp. 182-4 and plate x.

<sup>&</sup>lt;sup>40</sup> Cf. Ar., Nub., 52; Lys., 2; Thesm., 130, all with schol.; Hsych., Suid., s. v. Γενετυλλίς; Lucian, Am., 42, etc. In Lys., 2 Aristophanes mentions a shrine of Pan as well—cf. the proximity of the Vari cave. Hesychius, who calls Genetyllis a ξενική θεός, mentions a women's festival in connection with her, and it will be remembered that it was at Cape Colias that Athenian women were celebrating the Thesmophoria on the occasion of Solon's ruse to recapture Salamis (Plut., Sol., 8). His mention of dog sacrifices to her like those to Hecate suggests a Samothracian connection (see below, p. 239). For the name Genetyllis

The specific appearance of Aphrodite as a birth goddess is not surprising—she was anciently even identified with Ilithyia who appears as mother of Eros in the hymn of Olen the Lycian <sup>50</sup>—but more interesting still is the resemblance of the name Colias to the Aphrodite  $Ka\lambda\iota\acute{a}s$  of Samothrace and the  $Ka\lambda(\lambda)\acute{a}$ , with its Aphrodite shrine and fertilising waters, on Hymettus. The possible connection was pointed out long ago by Otto Crusius and others.<sup>51</sup>

The stories recounted in the Aristophanes' scholia to explain the name Colias ("more or less absurd" as Frazer called them in his note on Pausanias, I, 1, 5) nevertheless include one, the details of which bear a strong resemblance to other Attic legends of marauding raids by Tyrrhenian pirates or 'Pelasgians.' Schol. Nub., 52 declares that the Aphrodite shrine on Colias was established by an Athenian youth who was captured by Tyrrhenians, his limbs bound (hence the origin from  $\kappa\omega\lambda\dot{\eta}\nu!$ ), but was released with the help of the captain's daughter who fell in love with him. Compare with this the story in Schol. Il., XVIII, 493 which connects the young god Hymenaeus with Hymettus. He was an Argive youth who came to the rescue of Attic maidens whom Pelasgians were attempting to rape, hence the origin of the hymeneal sung in his praise by ai νομίμως γαμούμεναι. This story in turn is strikingly reminiscent of the account in Herodotus (VI, 137) of the attempted violation of women carrying water from Callirrhoe (which he calls Enneacrunus) by Pelasgians who occupied ground at the foot of Hymettus, and were expelled from Athens to Lemnos and other places, including Samothrace.<sup>52</sup> Whatever the historical truth of this matter may

cf. the  $\nu\dot{\nu}\mu\phi a\iota$   $\gamma\epsilon\nu\dot{\epsilon}\theta\lambda\iota a\iota$  of the Phalerum inscription above, and Hesychius' equation (s. v. 'A $\mu\phi\dot{\epsilon}\delta\rho o\mu os$ ) of a deity of that name in Aeschylus with  $\Gamma\epsilon\nu\dot{\epsilon}\theta\lambda\iota os$ . The Aeschylus reference is to the Semele (on which see above, pp. 232-3) and must refer to her child-bearing.

50 Paus., IX, 27, 2. Cf. Pfeiffer on Callim., fr. 524. Pausanias (VI, 20, 6) also mentions adjoining shrines of Aphrodite and Ilithyia in Elis.

51 Beiträge zur griechischen Mythologie und Religionsgeschichte, p. 17. Reference may be made here to Usener's hypothesis (Rh. M., XXIII [1868], pp. 316 ff.) of a deity invoked in the Samothracian mysteries in the form Καλλόνη, and equated (if taken as a personal name) with Ilithyia in Plato, Symp., 206D. This is attractive and fits my general argument, but it rests heavily on his emendation of Ar., Pax, 278.

<sup>52</sup> Idem, II, 51. For the identity of the rites of Lemnos and Samothrace, see Strabo, X, 466 ff.

be, the evidence cited points strikingly to a connection between Attica and the 'Pelasgian' area of the Aegean in ritual and folk-lore pertaining to fertility.<sup>53</sup>

Reverting to the worship of Aphrodite as a birth goddess in Samothrace and to her name Kalias, we may note that Lycophron twice (Alex., 449, 958) calls her Zηρυνθία 54 after the famous cave where Hecate also was worshipped (cf. Schol. Ar., Pax, 277, and Lycophron who himself uses the same epithet of Hecate at line 1178). Now Hecate like Artemis is notably associated with childbirth and frequently identified with Ilithyia, while Είλιόνεια, to whom according to Socrates Argivus (ap. Plut., Mor., 277b) the Argives sacrificed dogs διὰ τὴν ῥαστώνην της λοχείας, seems to be a combination of Hecate and Ilithyia, whose shrines in Argos were side by side (Paus., II, 22, 7). Hecate is ἔφορος πάντων καὶ κουρότροφος (Schol. Ar., Vesp., 804) and the Danaids in Aesch., Suppl., 676, invoking blessings on the Argives, pray that Artemis-Hecate γυναικών λόχους έφορεύειν. These last quotations in turn resemble the description of Aphrodite as  $\dot{\eta}$  της γενέσεως έφορος in Schol. Ar., Nub., 52 (à propos of the Genetyllides of Cape Colias), and κουρότροφος is an epithet more than once ascribed to Aphrodite also.<sup>55</sup>

In the concluding chorus of the Supplices, in which the theme of marriage and procreation is prominent, Aphrodite, Pothos, and Harmonia appear together (1034 ff.). Now Venus and Pothos according to Pliny <sup>56</sup> (N.H., XXXVI, 25) Samothrace sanctissimis caerimoniis coluntur, and Harmonia at some stage developed a strong Samothracian connection. <sup>57</sup> Peitho <sup>58</sup> also

<sup>&</sup>lt;sup>58</sup> The theme of barrenness in women and animals and its cure occurs in Hdt.'s sequel to the expulsion (VI, 139)—the penalty for the murder by the Lemnian Pelasgi of the children by Attic wives seized piratically (as in the stories quoted above!) from Brauron.

<sup>&</sup>lt;sup>54</sup> Cf. Et. Mag., Ζηρυνθία· 'Αφροδίτη έν Θράκη.

<sup>&</sup>lt;sup>55</sup> Plato Com., fr. 174,7; [Hom.], Epigr. 12; Anth. Pal., VI, 318; Luc., D. Meretr., 5, 1.

<sup>&</sup>lt;sup>56</sup> Pliny says that statues of these deities were made for Samothrace by Scopas, who made a Pothos statue for a shrine of Aphrodite in Megara, which also contained one of Peitho (Paus., I, 43,6). In Ar., Pax, 455 (cf. the Samothracian ref. of 277) Trygaeus pours libations to Hermes, another major deity of the island's cult, Aphrodite, and Pothos.

<sup>&</sup>lt;sup>57</sup> Earliest source is Hellanicus (F. G. H., 4F23), but cf. the Hesiodic P. Oxy., 1359, fr. 2. Full account in D. S., V, 48.

<sup>&</sup>lt;sup>58</sup> I agree with Bonner (H.S. C.P., XIII [1902], p. 136, n. 2) that

is mentioned in the same prayer of the Danaids, and it is intriguing to find her in Nonnus (III, 84 ff.) as a handmaiden of Harmonia in Samothrace, one of her tasks being to sprinkle the bridegroom ζωογόνοις λοετροῖς! I believe that Aeschylus may have had in mind here that aspect of Pelasgian religion which related to the propagation and protection of children, and which in Argive legend was attached to the Danaids themselves as spring nymphs and patronesses of marriage and childbirth. The climax of the trilogy is generally supposed to have been the defence of Hypermnestra by Aphrodite, with her famous speech (fr. 44) laying down the eternal law of procreation and birth which she alone had observed by sparing her husband Lynceus, through her natural desire for children and the perpetuation of the race.<sup>59</sup> The traditional hymeneal invocation σὺν κόροις τε καὶ κόραις (fr. 43)—at whatever point of the play it actually occurred—must have been grimly ironical in view of the determination of the other forty-nine sisters to prevent any such outcome. It is not improbable that in the familiar aetiological manner of Greek tragedy there may have been some reference in the trilogy (or less reverently in the satyr play Amymone) to the recompense made, for what was essentially as much an act of hybris as their original seizure by the sons of Aegyptus, by some, or all, of the

the sanctuary associated with Hypermnestra in Paus., II, 21, 1 is most likely to have been of *Aphrodite* Peitho (not Artemis)—cf. II, 19,6; 37,2. For an inscription from Lesbos combining Aphrodite-Peitho and Hermes, see Keil in *Philol.*, Suppl. II, p. 579.

<sup>59</sup> I agree with Mazon (Notice to Supplices, p. 8) that in Aesch., Pr., 865  $\pi a l \delta \omega \nu$   $l \mu \epsilon \rho o s$  is to be construed thus, rather than  $\mu l a \nu$   $\pi a l \delta \omega \nu$ , leading as it does to 869, αύτη κατ' "Αργος βασιλικόν τέξει γένος. This interpretation is favoured also by Sheppard, C.Q., V (1911), p. 221; Harrison, Proc. Camb. Phil. Soc., 160-2 (1935), p. 8; Diamantopoulos, J. H. S., LXXVII (1957), p. 222; Lesky, Die griechische Tragödie<sup>2</sup>, p. 99; Murray, The Motif of Io in Aeschylus' Suppliants, p. 60; and by Rose in his recent commentary, quoting Val. Max., II, 1, 4 cupiditatem liberorum. Better parallels are Eur., Suppl., 1087-8, έγω γάρ ἄλλους εἰσορῶν τεκνουμένους / παίδων τ' ἐραστὴς ἦν πόθω τ' ἀπωλλύμην; id.,fr. 316, 5-7, ἀλλ' οὐδὲν οὕτω λαμπρὸν οὐδ' ἰδεῖν καλὸν / ὡς τοῖς ἄπαισι καὶ πόθω δεδηγμένοις / παίδων νεογνῶν ἐν δόμοις ίδεῖν φάος (Schmidt θάλος). Could  $\pi \delta \theta os$  (Suppl., 1039) have the same implication, following as it does on έργοις έπὶ σεμνοῖς, the act of procreation? Even έρως is used of desire for children (Eur., Ion, 67, 1227; and fr. 1132, 6). Soph., El., 542 (Γμερον τέκνων) and 545 (παίδων πόθος), though not strictly parallel, might also be noticed. The view expressed above has been opposed most recently by Winnington-Ingram, J. H. S., LXXXI (1961), p. 147.

others after death in promoting fertility throughout Argos as river nymphs.<sup>60</sup>

#### III

To sum up, there is a strong probability that the subject matter of the new musical fragment is to be located in Attica (Υμησ[σ-), the speaker describing how her childlessness has been cured (ηὐτέκνησ' ἐγώ—ἀπαλλαγὴν τῶν κακῶν <sup>61</sup>) by the magical fertilising properties of the spring at Kyllupera (ψαύω δὲ λ[οντ-ρῶν? Cf. Aesch., Pers., 201-2: καλλιρόου ἔψαυσα πηγῆs) and perhaps by intercession with the appropriate deities ( $\pi$ ]αῖs "Αρεως = Eros?). She may compare her excellent progeny with that of some other person (? Πριά]μου μᾶλλον <sup>62</sup>), and bids the chorus dance (χορεύσατε). The reference in line 5 to bringing or raising a  $\pi \nu \rho \sigma \acute{o}s$  <sup>63</sup> is apposite enough to such a context, as torches were

<sup>60</sup> Above, p. 232. I might here remark on another connection of the Danaids with mystery and fertility cults—the view of Herodotus (II, 171) that they introduced from Egypt the Thesmophorian rites of Demeter and taught them to the Pelasgians. It is a pity that he did not elaborate this statement.

61 Common though this expression obviously is, it is worth remarking, in view of points raised in this article, that such phrases as  $\dot{a}\pi a\lambda\lambda a\gamma\dot{\eta}$  πόνων,  $\dot{a}\nu a\phi\nu\gamma a\lambda$  κακῶν, etc. have special associations with thanksgiving in certain rituals including the mysteries of Eleusis and Samothrace. See Thomson in J. H. S., LV (1935), pp. 21-2, and cf. Ar., Pax, 292-3, referring back to 277-8 where see schol. A courtesan in Alciphron (4, 17) swears  $\nu\dot{\eta}$  τὰ  $\mu\nu\sigma\tau\dot{\eta}\rho\iota a$ ,  $\nu\dot{\eta}$  τὸν τούτων τῶν κακῶν ἀπαλλαγήν.

<sup>62</sup> I suppose that πλοκά]μου μαλλόν (cf. Eur., Bacch., 114, πλοκάμων μαλλοῖs) is just possible, referring to the common rite of offering a lock of hair especially to river deities. See above, note 22 and such dedicatory epigrams as Anth. Pal., VI, 69 where a πλοκαμίs is offered in gratitude for marriage and male issue (by Callirrhoe!). But the first syllable of μᾶλλον has the highest musical note found anywhere in the legible portion—see the following note.

\*\* The reading is not certain: 'πυρσός is to be preferred to θύρσος in view of the accent and πυρί 'Turner (i.e. the prevailing practice in this and many other Greek musical fragments not to set an unaccented syllable of a word on a higher note than the accented one). I might however take the opportunity of quoting a curious note of Eustathius on θύσθλα (629, 50) . . . ἡ κλάδοι τινές, ὁποῖοι καὶ οὶ περὶ τὸν Διόνυσον βακχικοὶ θύρσοι οἱ βαρυτονούμενοι. οἱ γάρ τοι ὀξυνόμενοι θυρσοὶ γαμικὰ δηλοῦσι στέμματα. Cf. Hsych., θυρσοί. λαμπάδες, λύχνοι; Et. Mag., θυρσός · τὸ στέμμα τῶν γάμων; Et. Gud., θύσθλα · ai λαμπάδες. Reinach (R. H. R., LXVI [1912], p. 18, n. 4) distinguishes here θυρσὸς and θυρσός, but in the former case the conventional accentuation θύρσος is of course implied.

symbols of the cult of Ilithyia and an invariable adjunct to any ceremony of purification.<sup>64</sup> Finally she addresses herself to the pastoral folk 65 of the mountain, but one may well be puzzled by the inclusion here of μαινάδες. Are these simply Athenian women celebrating Dionysus on Hymettus, like the Thylades who were sent to represent Athens at his Delphic rites? 66 Or is the reference rather to oread nymphs of the stream who are sometimes more or less identifiable in literature with 'the nurses of mad Dionysus' in whatever locality they appear? 67 But a third attractive possibility, in view of Aristophanes' allegation that Kyllupera was a πορνεῖον, is the identification of μαινάς and πόρνη in cod. A of Pollux, VII, 203 (φορβάς την πόρνην λέγει ώς καὶ μαινάς καὶ μαχλάς) and in Hdn., Epim., 83. Pindar in his eulogy of the courtesans of Acrocorinth (fr. 107 Bowra) calls them φορβάδων κουρῶν ἀγέλαν, and Euripides' description (Bacch., 83) of the mountain-roaming maenads,  $\pi \tilde{\omega} \lambda o s \delta \pi \omega s \delta \mu a \mu a \tau \epsilon \rho \iota \phi o \rho \beta \delta \delta \iota$ , is not without a certain sexual suggestiveness. In his Pannychis (fr. 84; cf. fr. 67) Eubulus calls a group of Athenian prostitutes exposing their charms πώλους Κύπριδος, 68 and compares them to 'the maidens whom the Eridanus refreshes with pure waters.' This of course refers to the Italian river and the legend of Phaethon—it may well be a quotation or adaptation of a tragic line—but I cannot forbear to remark what added point there would be in these lines if there were also a local joke about a well-known πορνείον and the Attic river Eridanus, which, before Dörpfeld, was usually identified with that branch of the Ilissus which rises from the spring at Kaisariani! 69

The fact that the only two explicit references to Kyllupera cited by the lexicographers both come from Old Comedy, and that, for whatever reason, it did not attract the attention of

<sup>&</sup>lt;sup>64</sup> See for example Paus., VII, 23, 6 and above, note 43.

<sup>&</sup>lt;sup>65</sup> It has been pointed out to me in view of the proximity of βουκόλοι, μαινάδες that both words may have a Dionysiac significance (cf. Guthrie, Orpheus and Greek Religion, p. 260).

<sup>66</sup> Paus., X, 4, 2; 32, 5; D. S., IV, 3.

<sup>67</sup> Athen., 465a.

<sup>68</sup> Cf. Hsych., s. v. πω̃λος.

<sup>69</sup> Note also that in Callim., Ep. 38 Pf. a 'street-walker' ( $\pi\epsilon\rho l\phi o\iota\tau os$ ) dedicates to Aphrodite, amongst other things, her thyrsoi (though line 5 is corrupt, Bentley's emendation of  $\theta\acute{a}\rho\sigma ovs$  at least seems probable). See now, however, Giangrande, C.Q., N.S. XII (1962), pp. 218-22.

Pausanias, suggests that a fifth century source for the new monody is by no means impossible, whether it be satyr play or comedy, and the editors may be right in their view that it formed part of a collection of classical extracts to which music was set.

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The Oxyrhynchus Papyrus 1786 and the Relationship between Ancient Greek and Early

Christian Music

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# THE OXYRHYNCHUS PAPYRUS 1786 AND THE RELATIONSHIP BETWEEN ANCIENT GREEK AND EARLY CHRISTIAN MUSIC

BY

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It must be stated beforehand that the topics involved in the heading of the present article are each of a very controversial nature. Studies in ancient Greek music in this century have gone far to demolish former certainties, and quasi-certainties, and to arouse new doubts on almost every topic.<sup>1</sup> This may be illustrated by two instances of some relevance. The musical relics so far as they yield rules for melodic structure had left the impression of corroborating ancient testimonia about the Greek tonic accent. Recent investigations, however, led to stating that "the strict observance of accent in melody was not a classical, but a Hellenistic phenomenon, due to pedantry and snobbery".<sup>2</sup> In matters of musicology proper, the scales which we thought we were able to gather from Greek musical theory in a recent and well-considered study seem to have been built exactly contrariwise to what has been accepted for a long time, and in this way a number of mysteries left might be unriddled.<sup>3</sup>

In the field of Christian music the situation is not any better. Scholars of the 19th century as Gevaert and many a classicist of this century too thought Christian music to have developed from ancient Greek music, and Medieval musical theory seemed to corroborate this view. Again, a recent investigation shows that the theory of the eight modes (octo-echos) in liturgical music, Jewish as well as Christian, had its origin in the very old (Babylonian) cosmological calendaric principle of the pentecontade  $(7 \times 7 + 1)$  of liturgical seasons (cf. Fr. Pentecôte), and in that proves its Oriental descent.<sup>4</sup> Abraham Idelsohn in the beginning of this century

<sup>&</sup>lt;sup>1</sup> For a well-balanced picture of these doubts see I. Henderson, Ancient Greek Music (in The New Oxford History of Music I), 1957.

<sup>&</sup>lt;sup>2</sup> Thus R.P. Winnington-Ingram summarizes the results of W.B. Sedgwick in Ancient Greek Music 1932–57, Lustrum 3 (1958), p.43.

<sup>&</sup>lt;sup>3</sup> R. Tanner, La Musique Antique Grecque, spec. nr. 248 of La revue musicale, 1961.

<sup>&</sup>lt;sup>4</sup> E. Werner, The Sacred Bridge. The Interdependence of Liturgy and Music in Synagogue and Church during the First Millennium (London-New York 1959), part II ch. 2: The origin of the eight modes in music, p. 373-409. This work is the best intro-

made his amazing discoveries of archaic Jewish music in Yemenite and Babylonian communities, which furnished striking parallels to Christian ecclesiastical music, whereas subsequent decipherings of the earliest (ecphonetic) neumes considerably modified the views on these Medieval notation-systems of liturgical music and clearly showed the parallelism between ecclesiastical and synagogal musical practices.<sup>5</sup>

Nevertheless, in recent publications still the old view of cultural history notably about Christian music developing organically from classical Greek music is maintained. Carsten Høeg combated this view as advanced in Geistesgeschichte des antiken Christentums by C. Schneider (1954).6 Günther Wille in his almost encyclopedical Musica Romana (1967) took up position "gegen eine Herleitung der altchristlichen Musik des Westens aus der Musik der Synagoge". 7 When he adduces the Christian hymn of Oxyrhynchus as a welcome piece of evidence for his stand, however, his references to literature about the hymn do not exceed the year 1935 - strangely enough, as will be demonstrated presently. The term hymn is used here traditionally to indicate a doxological chant without stipulating any strict form. Already in the Apostolic age the terminology was confused: Mt. 26, 30 and Mk. 14, 26 in all probability use ύμνεῖν for psalmody, while Eph. 5, 19 and Col. 3, 16 still are much debated with regard to their meaning. Tertullian – one of our earliest authorities on liturgy – De or. 28 uses the expression inter psalmos et hymnos in the context much as a tautology. When he speaks of the impossibility of a marriage between a Christian and a heathen because of the impossibility for them to sing together (Ad uxorem 2,6), this does not prove the incompatibility of Christian and pagan music, but it certainly is a strong indication of the difference between them.

For my part I do not intend to exclude any and every interrelation between early Christian chant and Hellenistic pagan music. Undeniably there are many testimonia in the writings of Christian authors, mostly ecclesiastical authorities at that, which attest to the danger of bad influences spread by pagan musical practices, notably as regards the funeral

duction to most of the problems involved in the present article. For a shorter survey: Solange Corbin, L'église à la conquête de sa musique (Paris 1960).

<sup>&</sup>lt;sup>5</sup> Cf. C. Høeg, La notation ekphonétique (Copenhague 1935); Werner, p. 410-31.

<sup>&</sup>lt;sup>6</sup> C. Høeg, Les rapports de la musique chrétienne et de la musique de l'antiquité classique, *Byzantion* 25–27 (1955–57), p. 383–412.

<sup>&</sup>lt;sup>7</sup> Musica Romana. Die Bedeutung der Musik im Leben der Römer (Amsterdam 1967), p. 368. On the hymn of Ox. p. 369. Cf. my review in Latomus 30 (1971), 227 ff.

customs. Immediately, however, the question arises whether these dangers were thought to be engendered by the music itself or by the words of the songs involved (cantica diabolica, ᢤδαὶ πορνικαί) and the rather licentious atmosphere of those ceremonies.<sup>8</sup> The purpose of this paper is to make it acceptable both that indeed and for what reason specifically the pagan music itself not only was frowned upon but even was considered to be instrumental for losing one's Christian soul and salvation.

As we know, also pagan authors of the early Christian age frowned upon the music as generally cultivated in those times as opposed, romantically, to the days of olim when good old music was the ancilla to noble words (ethos-theory).9 It may suffice to refer to the moral indignation of Pseudo-Plutarch De musica and to the satiric irony of Lucian De saltatione, whereas it may be stated that the Romans considering their gravitas made it a point of honour to pass for amusical rather than to give away the high grade of their inborn musicality.<sup>10</sup> The unavoidable impression we gather from all sorts of information, both Christian and pagan, is that music as practised in the era of the Roman Empire was a "beat"-music in internationalized but manifold styles according to local origins but, imperturbably, "beat" - thematically built mostly to convey the eternal platitude of "All you need is love". The topicality of the Roman attitude to music is shown by Seneca Contr. 1 praef. 8 about youth: cantandi saltandique obscena studia effeminatos tenent, while the "beat" character is exposed by the younger Seneca De breuitate uitae 10, 12, 4: about those occupati who busy themselves only with the most futile and debasing occupations like illi, (qui in componendis audiendis discendis canticis operati sunt, dum uocem, cuius rectum cursum natura et optimum et simplicissimum fecit, in flexus modulationis inertissimae torquent,) quorum digiti aliquod intra se carmen metientes semper sonant... non habent isti otium sed iners negotium (the information probably refers to the old and widespread usage of snapping the fingers). Even ancient Greek music from the fifth century on was open to the development into this "beat". To put it in the words of Egert Pöhlmann: "schon Aristoxenos... kommt

<sup>&</sup>lt;sup>8</sup> For this topic cf. Høeg, art. cited in n.6, p.392; Wille, *op.cit.*, 381-83 and the literature given there. No wonder that the orthodoxist Ephraim composed many a carmen exequiale. Cf. n.29-31.

<sup>&</sup>lt;sup>9</sup> As a topic it started at Plato, Rep. 3, 400.

This is the thesis of Wille. It is summarized by the same author in Lex. der alten Welt = Lex. der Antike I 3 (1969) s.u. Musik C 1-7.

dem neuzeitlichen Taktbegriff so nahe, dass... ein musikalischer Umbruch zugrunde liegt."<sup>11</sup>

In dating the "Umbruch" in the fourth century, however, Pöhlmann seems to me all too cautious. As a matter of fact, Aristophanes in his Ranae closely connected the expression of ugly truth (1053 sqq.) to musical (1301 sqq.) and particularly rhythmical innovations (1314, 1348). These rhythmical innovations are focused and symbolized as it were in the doubtless exciting appearance of a rather wanton "beat"-girl: Ποῦ 'στιν ή τοῖς ὀστράκοις/αὕτη κροτοῦσα; Δεῦρο, Μοῦσ' Εὐριπίδου,/πρὸς ήνπερ ἐπιτήδεια τάδ' ἔστ' ἄδειν μέλη (1305-7. Coulon-van Daele in the Budé-edition ad loc.: "Apparaît une joueuse de castagnettes, nue"). Meillet, therefore, is not to be doubted about his dating the first signs of what he calls "la ruine du rythme quantitatif" as early as the fifth century.<sup>12</sup> For my part I would call attention to a strikingly strange feature in the musical history of Greece. The cult of Pan at Athens is closely associated with the Persian wars (Herod. 6, 105–106). Yet shortly afterwards flute-music, though championed if not "invented" by the same god, <sup>13</sup> was rejected. Sometime after 460 the Athenian government had the famous Athena-Marsyas group of Myron placed on the Acropolis. Considering that this happened during the "cold war" against Sparta and the war against Boeotia, both strongholds of aulos-music, we cannot fail to accept the happening on the Acropolis as an insult to both states.<sup>14</sup> Primarily, however, it demonstrated the official rejection of the music of the flute.15

It is not easy to distinguish to what degree the firm connexion between music and words was a consequence of the musical character of the Greek language. The prosodic and musical data as we have them clearly suggest

<sup>&</sup>lt;sup>11</sup> E. Pöhlmann, Griechische Musikfragmente. Ein Weg zur altgriechischen Musik (Nürnberg 1960), p. 52; cf. p. 48: "In der Rhythmik war ja der wesentlichste Fortschritt, die Emanzipation des Rhythmus vom Metrum, schon im 4. Jh. geleistet worden."

<sup>&</sup>lt;sup>12</sup> A. Meillet, Aperçu d'une histoire de la langue grecque (61948), p. 269.

For Pan as related to flute playing in general see R. Herbig, *Pan* (Frankfurt 1949), p.25–26 and n.36; to the origin of music Lucr. R.N. 5,1379 sqq.

<sup>&</sup>lt;sup>14</sup> Ch. Picard, Manuel d'archéologie grecque, II (Paris 1939), p. 232–41. E. Berger, Vorbemerkungen... Ostgiebels (1958), p. 34, is apt to date the group shortly before 447. If that be the case the happening must be related to the second expedition against Boeotia in 447.

Also a popular character as Alcibiades was credited with the same rejection: Plut. Alc. 2. For the alleged rejection about 500 by Pratinas see RE 22 (1954), c. 1725–27.

that the connexion was of a highly and increasingly conventional nature.<sup>16</sup> Since the underlying idea of the imitative and, therefore, ethical function and value of music existed also outside Greece, the specific musicality of the Greek language (the notion of quantity in the first place) cannot have been the source from which the idea has sprung. The emancipation of music from words, therefore, was a quite natural process of interrelation between the evolution of speech and musical experiments. It was backed by the rise of literary prose and rhetoric. Eventually, philosophy lost the battle against rhetoric over the educational leadership, and we may accept the Ranae as representing the acme of that battle, whereas Plato in his references to Damon's ideas of musical education offers no more than the impressive resonance of it.<sup>17</sup> It is in this process that flute playing got the mark of official rejection since this sort of instruments was most suited to musical experiments and innovations which affected, and ultimately would annihilate, the conventional connexion between music and words. Such experiments affected rhythm in the first place: "Das Zupfinstrument hat ja keinen Dauerton, während das Blasinstrument durch die genau ausgehaltenen Zeitwerte den Rhythmus auch ohne Stütze des Wortes halten kann."18

Nevertheless, philosophers and harmonists<sup>19</sup> alike continued to rely only on strings for the systematization of intervals and the building of musical scales; ethos-theory was sternly maintained notwithstanding oppositionalists like the author of the Hibeh-pamphlet.<sup>20</sup> But it must be clear that more popular musical forms, from the fifth century on, steadily developed into "beat". To quote Pöhlmann once again: "Jede Musik, die vom Arbeits-, Tanz- oder Marschlied ausgeht, muss fast zwangsläufig zum Takt kommen. Dass die absolute Dominanz der Sprache auch in der griechischen Rhythmik schwerlich das Primäre war, zeigen schon die

<sup>16</sup> Cf. Pöhlmann, op.cit., esp. p.21 and 31 n.1. Cf. also the introductory chapter of Aristotle's *Poetics*. For the Roman assimilation of the connexion see Quintilian 9,4. Herein a significant testimony as to "beat" (9,4,51), cf. Wille, p.240.

<sup>17</sup> Cf. E.A. Lippman, Musical Thought in Ancient Greece (New York-London 1964), p. 63: "Plato found himself opposed to what was actually a more progressive attitude, for ... rhetoric frankly accepted the musical disintegration and the new specialization, replacing universality with versatility." Cf. also E. Moutsopoulos, La philosophie de la musique et le théâtre d'Aristophane, as summarized in L'année philol. 1964 (1966), p. 319.

<sup>&</sup>lt;sup>18</sup> Pöhlmann, p. 35.

<sup>&</sup>lt;sup>19</sup> In terms of Greek musical history they should rather be called canonists.

Writing about 400 B.C. he was the first we know of who combated the educational valuation of music, cf. *Hermes* 44 (1909), p. 503–21,

Termini Arsis, Thesis und (Vers-)Fuss, die auf die Choreographie hinweisen."<sup>21</sup> Our relics of Greek music, most of which are of Hellenistic times, appear to submit somehow or other to conventionality as established in the musical theory. Yet there is one piece that does not fit exactly in this picture, viz., the famous Ox. Papyrus 1786 (vol. 15, 1922).

This papyrus (end of the third century) contains the fragment – and the only one that we have - of a Christian hymn written in the Greek language, with Greek musical notation the rhythmical signs included. As is to be expected, it is adduced as a powerful piece of evidence by those who advocate the continuity between ancient Greek and early Christian music. Even Carsten Høeg, famous for his investigations in the field of Byzantine music, in a rather racy article intended to oppose this view only admonished that one swallow does not make a summer, or words to that effect.<sup>22</sup> Eric Werner, the successor of Abraham Idelsohn as professor of liturgical music in the Hebrew Union College at Cincinnati, as regards the hymn wrote: "In all these endings, we encounter the typical final melismata of Jewish psalmody although, in melody and structure, the piece is distinctly Hellenistic, even written in the Greek letter notation."23 However, Werner not being specialized in Greek music, let us hear what Pöhlmann has to say about the hymn: "Im ganzen entsteht der Eindruck, dass der Komponist des Hymnus griechischen Vorbildern folgt, jedoch für die griechische Sprache kein Ohr hat. So erklären sich die metrischen Verstösse, so wird auch verständlich, dass hier der Wortakzent häufig der Melodieführung geopfert wird. Vermutlich deutet das Streben nach reicher Melismatik ohne Rücksicht auf Quantität und Akzent auf Einflüsse hebräischer Sakralmusik."24 So what Werner thought to be "distinctly Hellenistic" - meaning "Greek" after all appears to be highly controversial. Pöhlmann was definitely at fault in attributing the many deviations from Greek music to a composer who "für die griechische Sprache kein Ohr hat". Høeg already had remarked: "Rappelons que tous les chrétiens de cette époque qui étaient capables d'écrire en grec, avaient fréquenté une école hellénique et paienne." But, as it is, specialists of ancient Greek music generally do not know about different contemporary music, let alone of Byzantine hymnody. An allround musicologist as Curt Sachs calls the hymn - in

<sup>&</sup>lt;sup>21</sup> *Op.cit.*, p. 31, n. 3.

<sup>&</sup>lt;sup>22</sup> In the art. cited in n.6.

<sup>&</sup>lt;sup>23</sup> Op.cit., p. 355. Various transcriptions in MGG vol. 4, c. 1053–56 (1955).

<sup>&</sup>lt;sup>24</sup> Op.cit., p. 47,

the section "Greece and Rome" - an "exceptional piece" in that it does not show a "thetic center". Moreover, so he observes, "(it) was certainly not "dissolute and voluptuous", in spite of its Hypolydian key and mode".25 Shortly after Sachs, however, Egon Wellesz in the Class. Quarterly of 1945 in a powerful demonstration adopted the hymn for Byzantine musicology relating its structure to the Syrian origin of early ecclesiastical chants. "This may be correct" - so Winnington-Ingram concludes in his "Forschungsbericht" (Lustrum 3 (1958), p. 10) - but when he adds: "His transcription, however, disregards the fact that the rhythmical notation is Greek and should be interpreted in the light of our other Greek evidence", it rings almost like a sigh for losing the piece from the, as it is, unimpressive total of Greek musical relics. The Christian hymn, to be sure, is no representative of ancient Greek music at all - "in spite of its Greek notation". 26 There might be a certain amount of melodic congruence with certain Hellenistic melody-building but, honestly, we do not have any certainty about intonations, neither in Greek nor in other contemporary music. Melodic congruence, however, if demonstrable at all, does not prove anything as soon as the "Erscheinung", so to say the spirit, of the music is different. Do we have to leave this question at Sachs declaring that the musical style of the piece certainly was not "dissolute and voluptuous", or does the hymn itself enable us to say more about that? I think it does.

The most controversial point left is the rhythmical interpretation, as we could gather already from the remarks of Winnington-Ingram. Here precisely is the point where Christian music presented its novelty and moved away from any pagan contemporary music. Something of this kind had been already felt by scholars who like W. Meyer thought Christianity to be responsible for the appearance of accentual poetry, Greek and Latin, relating the phenomenon to Syrian hymnody.<sup>27</sup> The

<sup>&</sup>lt;sup>25</sup> C. Sachs, The Rise of Music in the Ancient World East and West (New York 1943 = London 1944), p.250-251.

<sup>&</sup>lt;sup>26</sup> E. Wellesz, A History of Byzantine Music and Hymnography (Oxford 1949), p. 129 (2.ed. 1961).

W. Meyer, Anfang und Ursprung der lateinischen und griechischen rythmischen Dichtung, in Abh. München 17 (1886), 265-450, esp. 363 ff. Leaning on the observations of Card. Pitra and Bickell about the priority of the Syrian rhythmical hymns he concluded, rather naively (in the light of our evidence of papyrology): "Durch jenes semitische Vorbild wurden diese Völker angeregt, die Quantität nicht mehr zu beachten" (p. 377). Corbin (see n. 4) is more cautious: "la traduction biblique ... est probablement responsable en partie de l'affaiblissement de la notion quantitative" (p. 65).

matter is not as simple as that. Werner, speaking of "the rapidity with which the Syrian type swept all over the Western and Eastern Church", rightly observed: "Had the new system been entirely alien to Romans and Greeks, it would have encountered much more opposition than it actually did."28 Hymnody, however, represents only a small part of Christian chant and, moreover, its acceptance did not go as smoothly as Werner's words seem to imply. Werner, to be sure, refers here to the example of Ephraim's hymns. But it is worth while to examine the story about Ephraim's hymnodic activities as thoroughly as the testimonia enable us to do.<sup>29</sup> To begin with, there is probably a certain amount of apocryphal telling in the story, so far as it reminds us of many a tale about hymns being both enthusiastically accepted by the common people and, rather or bitterly, opposed by ecclesiastical authorities. As regards the Western orbit, one only has to think of the hymns of Ambrosius. Scarcely four or five of all Ambrosian hymns have succeeded in earning the approval of the Roman ecclesiastical authorities but Augustine leaves us in no doubt that the hymns aroused an overwhelming enthusiasm with the people (Conf. 9, 6-7; 10, 33). Of course, I am not prepared to ascribe Augustine's confessions about these hymns arousing in him strong but contradictory emotions to any intention of telling apocryphal tales. On the contrary, it outlines sharply the actual course of events about Christian hymnody and it may, therefore, elucidate the story about Ephraim's activities as told by several authors of early Ecclesiastical History. The most elaborate version of it is furnished by Sozomenus (3, 16) whereas Theodoretus has some interesting details to add.<sup>30</sup> From them we learn that Ephraim (ca. 365) appropriated hymns with heretical texts made by the gnostic Bardesanes (ca. 200) and being very popular for their music as composed by Harmonius, the son of Bardesanes, in order to use the same melodies now provided with orthodox texts by himself as an antidote to the "sweet poison" administered to healthy people formerly.31 When we probe these texts and compare them with

<sup>&</sup>lt;sup>28</sup> *Op.cit.*, p. 349–50.

The story as told by Ephraim's ancient biographer: in Meyer op.cit. in n.27, p.376.

<sup>30</sup> Hist.eccl. 4,29,2. The story is also repeated, rather clumsily, in Cassiodorus, H.e.8,6: Et quoniam tunc Harmonius Bardisanus quaedam cantica componens, et impietatem melodiae suauitati permiscens, illiciebat audientes et capiebat in peste, iste (sc. Ephraim) sumens inde concentus pietatem cantilenae permiscuit et audientibus suaue nimis et utile medicamen apposuit.

<sup>31</sup> Bardesanes's ingenious innovation as annexed by Ephraim and revealed in his

a chant of Ephraim himself on Bardesanes, it becomes clear that those hymns owed their popularity to their rhythmical structure (Soz. 3, 16, 7: ίδων δὲ Ἐφραὶμ κηλομένους τοὺς Σύρους ... τῷ ρυθμῷ τῆς μελωδίας ... ἐπέστη τῆ καταλήψει τῶν Άρμονίου μέτρων). The rhythms precisely of Bardesanes's hymns were the ingredients which "sweetened" the poison of the heretical contents. About the exact structure of these rhythms, however, we have no absolute certainty, since the music of the hymns has not survived. But Aug. Hahn already observed that the preeminent Ephraimic metre shows a close similarity to the Anacreontic metre of 'H γη μέλαινα πίνει.<sup>32</sup> The Syriac language showing no signs of quantity, this rhythm only can be interpreted in terms of dynamic accents and beats. Werner, in view of the tradition having it that both Harmonius and Ephraim were well-acquainted with Greek and Greek culture, is apt to think that the metre was taken over and calls it a "Graeco-Syrian element in the music of the Church".33 As the Anacreontic rhythmical systems certainly were of a popular nature and meant to be sung, and as they moreover were regularly used in processions,<sup>34</sup> Werner was quite right in doubting that the Syrian type was "entirely alien to Romans and Greeks". However, it seems preferable to call it a Hellenistic element, which including "Graeco-Syrian" has a ring that goes far beyond national or ethnic frontiers.

It is precisely this Hellenistic element, the "beat"-character of music all over the Roman Empire, that for centuries along was combated by ecclesiastical authorities East and West as endangering liturgical music and poisoning the Christian mind.<sup>35</sup> It goes without saying that the

Syriac words is rendered by Dom J. Jeannin: "en poids et mesures" (*Mélodies liturgiques syriennes*, I 66), by Werner: "in measures and metre" (*op.cit.*, 212), by Meyer: "Nach Längen und Schweren" (*op. cit.*, 375). Anyhow, it was "popular".

<sup>32</sup> A. Hahn, Bardesanes gnosticus, Syrorum primus hymnologus (Leipzig 1819), p. 39 ff. Cf. Hilary's Hymn Adae carnis gloriosae in uersus quadrati!

Op.cit., p.350. The phenomenon has a startling implication as regards the rhythmical character ("Scheinprosodie") of pre-Christian Anacreontic poetry.

This for Christians was considered a dangerous feature of daily life. As late a poet as Pseudo-Venantius Fortunatus wrote a hymn *Tibi laus perennis auctor* in Anacreontic rhythm which was used as a procession chant on Easter-eve, cf. Wille, p. 305.

<sup>&</sup>lt;sup>35</sup> Cf. Th. Gérold, Les pères de l'église et la musique (Paris 1931). The heart of the matter as exposed above is already dimly seen in Wellesz, op.cit., p. 68: "The hostile attitude of the Church is easy to understand. From the second to the fourth centuries the members of Christian communities lived in the midst of a highly developed civilization and were tempted to take part in the theatrical performances, dances and processions they were constantly witnessing", and p.81: "Drums, cymbals, clappers, horns,

exciting beat-rhythm of the pagan music was experienced as instrumental for losing one's Christian soul and salvation. The rejection of it was related directly to the pastoral-theological rejection of the lusts of the flesh, and education in the Christian spirit started with repressions in this respect. As a matter of fact, Christian authors did not keep it a secret that their anathema's meant exactly the rhythms and the beatinstruments of the pagan music. Thus Arnobius in a well-known passage intended to ridicule the pagan gods and their cults fulminates in terms as: aeris tinnitibus et quassationibus cymbalorum ... tympanis ... crepitus scabillorum (Adv. nat. 7, 32). Such utterances leave us in no doubt whatever about the question what was meant and experienced as being the quintessence of pagan music. The drastic rejection of it, however, put the Church up against enormous difficulties. Throughout Antiquity Christian literature wrestles with questions such as: whether or not music in liturgy was to be tolerated at all; if so, what kind of music; whether or not singing was to be executed by the parish, and for that matter singing by women appeared to be a point of utter vigilance, and so on. The Bible rapidly becoming the Book of Books for Christianity Jewish psalmody was bound to become the model. But according as - locally as well as chronologically - Christianity drew away from Judaism problems only were doubled. To put it in the words of Høeg: "S'il est vrai que la musique de la Synagogue juive - et peut-être aussi celle du Temple - sont à la base de la musique chrétienne, il faut ajouter aussitôt que le christianisme, religion nouvelle très soucieuse de son indépendance et consciente de sa mission universelle, a dû développer une musique bien différente de celle de la religion-mère et en accord avec l'esprit du Nouveau Pacte. La musique chrétienne devint très vite, en Occident et en Orient, une musique nouvelle, dans le sens complet de ce terme (pace historicorum dixerim)."36 Yet there is no question about Jewish psalmody being fundamental to Christian ecclesiastical chanting, in which ethnic forces shaped local modifications in a rather wide range. The rejection of contemporary pagan music was that much total that the existing Greek notation-systems were not really considered for the transmission of Christian music. In fact, musical tradition in Antiquity mostly if not exclusively was provided for viva voce. For that reason I am on the side of

and flutes were the instruments mainly used in orgiastic rites"; p. 145 on rhythmical execution of Church-music in 5th cent. Egypt.

<sup>&</sup>lt;sup>36</sup> Art.cit., p. 402.

those specialists of Greek music who consider the literal notations to have been almost exclusively a matter of theorists and schoolmen, and a highly intricate one at that.<sup>37</sup> In view of the Church's universal mission, however, even musical tradition could not be set wild. On the contrary, as a liturgical constituent of primary importance the musical tradition was to be watched over with unceasing vigilance. Therefore, a new notation-system had to be found. Which led to the neumes coming into existence.

Again the question arises what should be the meaning of our Christian hymn being written in the Greek musical notation. First of all we remember that the rhythmical signs, if "interpreted in the light of our other Greek evidence", clearly show a considerable amount of "metrischen Verstösse". Since the author of the hymn – as we already have seen - must have been fully aware of that and as, moreover, the papyrus suggests to be a piece of theoretical purport<sup>38</sup> we now may be prepared to consider it to be exactly what its contents show it to be: a demonstration of the inadequacy, and at least as regards the rhythmical signs, of the fundamental error of using the existing Greek notation for Christian music. For my part I am prepared to suggest that the demonstration goes as far as to show also that the Greek melodic signs did not fail to denature the flow of a melody which was "certainly not "dissolute and voluptuous", in spite of its Hypolydian key and mode". In fact, as regards their visible shape the neumes originated for a technical reason. "It is not surprising that the new system was vastly different from the Greek conception, for it had to serve another purpose. The Greek notation had to define each note, since its music was syllabicrhythmic, and its phrases not melismatic. The Church required a method by which the most venerable elements of liturgical music could be fixed, namely the cantillation of the scriptural lessons and psalmody. The Greek system, with its minute description of every tone, would have proved very cumbersome had it been applied to the new task. Phrases or syntactic units had to be provided with notation, not individual syl-

Pöhlmann, op.cit., p.83-84, adduces a dozen vase-paintings as proving the use of the musical signs for common practice. It must be said, however, that the senseless (so Furtwängler) daubs and dots contained in those paintings prove nothing of the sort.

The very use of the intricate system suggests the writer to have been a specialist. Besides, most of the musical relics in ms.-form presuppose theorists for authors just like the fragments in the *Bellermanni Anonymus de musica*.

lables. Hence the ecphonetic origin of the Greek and Roman neumes."39 Exactly for this reason I cannot adhere to the conception of De Coussemaker (1852) that the neumes only must have originated from the Alexandrian and Byzantine Greek accents. As many specialists in the field see it nowadays, the neumes-systems traced their origin back to very old (Babylonian) chironomic signs - as the term itself at least suggests. 39a However, for the purpose of the present paper this vexed question does not matter much. It may be clear that the Christian hymn in Greek musical notation, Ox. Pap. 1786, far from being an eminent piece of evidence for the continuity between ancient Greek and early Christian music, must be considered as an obvious demonstration of the necessity of creating and organizing an entirely new notation-system for the new Christian music. "Its oldest documents can be traced to the seventh century, and there were probably earlier attempts" – so Werner states. 40 Perhaps it is not to be hoped that any of these earlier attempts will turn up. As we know, cantors of Jewish origin many times were appointed, even attracted, to teach Christian communities the cantillation of scriptural lessons and psalmody. In this the ancient way of oral tradition did not fail to show its unescapable vigour, but the mission of the Church could not stop at that. Sooner or later the chironomic instruction had to be committed to writing. The novelty of the Christian music combined with the missionary activity of the new religion forced the new notation-

Werner, p.358. Cf. Wellesz, p.216: "the ecphonetic signs are set, in the main, at the beginning and at the end of a group of words."

As regards the meaning of the term, it seems appropriate to refer to Athenaeus 14, 617f-618b: here the ensemble of flute and lyre is said to be settled by συννεύματα meaning the nods by which the instrumentalists regulated the interplay between them. Gesticulation always has been prominent in controlling musical performance as well as in visualizing musical intentions (χειρονομία, even when said of the legs: Herod. 6, 129). Some of the so-called Dead Sea Scrolls contain marginal signs which might be interpreted as forerunners of the ecphonetic neumes, as done by E. Werner in Mus. Quart. 43 (1957), 21-37. If this view ever can be substantiated it would certainly revolutionize our ideas of the origin of neumes. (One of the signs meant is to be seen in the well-known photograph of a scroll of Isaiah beneath col. 32.) As regards the Byzantine Greek accents it seems reasonable to suppose that they might have proved convenient according as the exphonetic signs proved insufficient for the missionary transmission of music, i.e. when the original improvisation between the main caesuraaccents had to be abandoned in favour of a continuous fixation of the cantillation on behalf of people not acquainted with the Oriental musical patterns involved (cf. Werner, Sacred Bridge, p. 421 and 430 n. 34).

<sup>&</sup>lt;sup>40</sup> *Ibidem*, p. 357–358. According to Høeg (*La not.ekphon.*, p. 38–39) and Wellesz (*op.cit.*, p. 216) the ecphonetic system seems to have been introduced towards the end of the fourth century already.

system into existence, and particularly linguistic differences were responsible for the scattering of the notation into a number of systems. Precisely the splitting up in a Greek and a Latin system is an additional argument against the assumption of Christianity being responsible for the appearance of accentual poetry Greek and Latin. This observation brings us back to "metrical" hymnody.

As it has already been said, hymnody from the very beginning by ecclesiastical authorities was felt to be pagan for its peculiar musical structure, while for the same reason it was extremely popular. That is why hymnody became the preeminent vehicle of heretical conceptions and thereby mistrust was doubled. Especially the Latin Churches time and again expelled hymnodic forms which time and again slipped in between scriptural chants, whereas in the Eastern Churches they were organized into real Christian hymnography permeating their liturgies. Real Christian hymnography presumes real Christian musical style, and what this meant is well exposed by an interesting observation about the Ison, the most important neume, being the indicator of melodic tenor. In the so-called *Papadike*, a Medieval instruction-book for the priests, about the Ison it is stated: Άρχή, μέση, τέλος, καὶ σύστημα πάντων τῶν σημαδίων τῆς ψαλτικῆς τέχνης τὸ ἰσόν ἐστι ... λέγεται δὲ ἄφωνον ούχ ὅτι φωνὴν οὐκ ἔχει, ἀλλ' ὅτι ἀριθμὸν φωνῆς οὐκ ἔχει. φωνεῖται μέν, οὐ μετρεῖται δέ.41 This definition, or paraphrase, makes it clear that the body of Christian ecclesiastical music was "derhythmed", denuded of rhythm. As far as I see it, Jewish liturgical music presents an analogous development so far as, according to Sachs (op.cit., p. 90 f.), "archaic Hebrew rhythm (then) was less free", in view of the Temple-music being accompanied by "group dancing and drum beating". Possibly, the Diaspora, i.e. living amidst the Hellenistic pagan beat-music, accounts for the "derhythmizing" of synagogal music. No wonder then that early documents, of the 9th century, according to the French musicologist Jules Combarieu in their neumes show no signs of rhythmical distinguishing and may be called "ces preuves de l'égalité des notes dans le plain-chant". 42 Working back, therefore, from these data to the data about early Christianity as given above we may conclude that the most characteristical, and so to say the fundamental,

<sup>&</sup>lt;sup>41</sup> Wellesz, p. 235, n. 2.

<sup>&</sup>lt;sup>42</sup> Histoire de la musique (Paris <sup>6</sup>1938), vol. I, p.253 (1.ed.1913). Here C. resumes the results of an article signed by him and published in *La revue musicale* 1901, but the documents came from "Solesmes". Cf. n.49.

feature of early and real Christian music was the absence of rhythmical structure. This thesis will make quite a number of later developments inside as well as outside ecclesiastical music much more understandable than they ever can be without agreeing to it. To give some instances: why did the great Father Augustine start De musica with six books about rhythm? (for those about melody he could not afford the time) - and what could have been the meaning of his personal pausal theory therein?43 Why did many a Christian author compare ecclesiastical community singing with that of rowing songs, unless to stimulate the rather slow evenness of chanting?44 What exactly was the function of organ playing in the Byzantine Liturgy, and was it welcomed in Western practice only because Byzantine Emperors made organs a present to their colleagues in France?45 Is the origin of tropes and sequences to be explained exclusively as a mnemotechnical adjustment?46 Did the ecclesiastical anathema of the music of the Troubadours and Trouvères for being lasciuum et impurum concern its major-key or rather its worldly rhythms?<sup>47</sup> Why had the fight over the "nombre musical" of Gregorian chant to be decided

For Augustine's theories see Wille, p. 603–623.

<sup>&</sup>lt;sup>44</sup> For this topic see Wille, p.123-124. The Anonymi institutionum disciplinae (7th century but not by Isidorus of Sevilla) as regards the learning of singing contains some remarkable recommendations for the son of a Gothic nobleman. P.Riché, De l'éducation antique à l'éducation chevaleresque (Paris 1968), p.76, translates: "Il faut qu'il chante lentement en apprenant l'art de moduler sa voix et de se tenir, qu'il le fasse agréablement et qu'il ne connaisse rien d'érotique ni de honteux."

<sup>&</sup>lt;sup>45</sup> For this topic see Wellesz, p. 94–98; Id., Eastern Elements in Western Chant (MMB; 1947), p. 165. Differently W. Apel in Speculum 23 (1948), 191 ff.

<sup>46</sup> Cf. Werner, p. 564–565: "In some cases even the text of the (scriptural) lesson was interspersed with tropes ... Usually the 'syllabization' of the melismatic tradition is interpreted as a sort of mnemonic aid for the singers, at a time when written music was not too easily obtainable. However, there might be another reason beneath this rationalizing idea that accounts for the dissolution of melismata into syllabic units. The secular folk-song of the Occident began to emerge at the end of the eleventh century; in general the Church was not too fond of it, since it rightly sensed a relapse into barbaric-pagan customs ... It is possible that the peoples of the West sensed the ancients chants of the Church as alien elements, especially the long extended melismatic songs; and the clergy compromised with that latent animosity by dissolving these melismatic chants into the (syllabic) tropes and sequences. This was especially useful at the great feasts of the Church, when popular interest and acclamation were most desirable. We learn accordingly that the tropes were sung particularly on high feasts and were designated 'festival lauds'." Cf. Wellesz, *Eastern Elements*, p. 165–185.

<sup>&</sup>lt;sup>47</sup> E. Bücken, *Die Musik der Nationen* (Leipzig 1937), p. 32: "Das eigentlich Neue und speziell "Weltliche" der Troubadour- und Trouvèremusik liegt in ihrem Rhythmus."

by a papal bull? Above all, I think, the thesis illuminates both that and why early Christian music meant neither a return to allegiance to the venerable Greek classical music nor amalgamating with Hellenistic pagan music on the basis of Greek musical theory, while the hymn of Oxyrhynchus can be accepted as settling that.

However, rhythm being an ample term, most writers about ecclesiastical chant speak of its "free rhythm". What is meant by that may be elucidated by putting it in the words of Wellesz stating about Byzantine hymnography: "great skill was required to achieve a perfect union between the music and the words... in order to make the highest points of the melodic curves coincide with the stresses of the verses."48 Wellesz has reproduced the hymn of Oxyrhynchus in a modern notation without bars, of course. It may be clear, therefore, that the "union" between music and words in early Christian music did not rest upon any metrical or rhythmical structure of the underlying words but upon the "Bedeutungszusammenhang" of a group of words. That is why T. Georgiades said: "Das Kyrie eleison – übrigens ein ursprünglich spätantik-heidnischer Ruf – der Prozessionsscharen ist zwar griechische Sprache, aber christliches Griechisch, eine Sprache, die der Musikè entgegengesetzt ist."49 And by "Musikè" he meant the ancient Greek conception of the union between words and music.

Speaking of continuity between ancient Greek and early Christian music, therefore, must be limited to one underlying idea of musical theory. In fact, Platonic or rather Neo-Platonic conceptions about music not as an aesthetic but as an ethical value presented the only link between the one and the other. However, that is not the materials out of which music has ever been made, whether Christian or Greek. Music is made out of rhythm and melody. About rhythm enough has been said above. As regards melody, I hope the *Appendix* will satisfy the examiners.

<sup>48</sup> Op.cit., p. 274. In modern Greek I would call it an ἰδιόρρυθμη – μὰ θαυμάσια – μουσική. The same applies to Gregorian chant. The term "rhythmical neumes" for the various signs which were introduced not before or even after the tenth century to facilitate the phrasing of the melodies, and acknowledged as it were by way of concession to assure a unified execution, to me seems rather improper. Cf. Eastern Elements, p. 186–190.

<sup>&</sup>lt;sup>49</sup> Musik und Rhythmus bei den Griechen (Hamburg 1958), p.62; cf. Id., Der griechische Rhythmus (Hamburg 1949), p.122–145. Cf. also the severe characterizing of Gregorian chant by Combarieu, op.cit. in n.42, p.256–262 ("anti-musical et admirable").

APPENDIX: A TEST-CASE



In order to enable the reader of this article in some degree to put the theories to the test the most striking example of "congruence" between Greek and Christian music is given in comparing the Seikilos-epitaph and the Gregorian antiphon *Hosanna filio David*. The melodic congruence for the first time was signalized in 1894 by Ph. Spitta.<sup>50</sup> Werner lastly commented thus: "Here, a good deal of the Hellenistic melody has been absorbed, but the Christian arrangers, as was their custom, insisted upon emphasizing the *pausa* in each verse. Thus they had to add a pausal melisma for the words ,David' and ,Israel'. The adaptation tried, moreover, to stress the twofold *Hosanna* of the first and second verse by the identical musical phrase, thereby cramping the flow of the Greek cadence." So he too distinguishes the pieces sharply for the difference between them in rhythm and phrasing.

Now what about "a good deal of the Hellenistic melody"? Actual execution of the notations as given above does not fail to suggest that the congruence is a matter of an optical illusion, created particularly by the transcriptions being written in the same key, much more than of audible similarity.<sup>52</sup> Besides, execution may vary vastly according to the

Vierteljahrschrift für Musikwissenschaft 10 (1894), 103–110.

<sup>&</sup>lt;sup>51</sup> *Op.cit.*, p. 354.

<sup>&</sup>lt;sup>52</sup> Høeg, art.cit., p. 393, does not hear the congruence either. Cf. also the strong denial of congruences by P. Wagner, Einführung in die gregorianischen Melodien (1911–21), III p. 58.

circumstances as suggested by the words. Furthermore, there is no absolute certainty about the intonations of the original pieces: all modern transcriptions are bound to be approximate to a great extent. Finally, what if Robert Tanner (see n. 3) ever would appear to be right?<sup>53</sup>

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<sup>&</sup>lt;sup>53</sup> Professor Fellerer, therefore, misrepresents the hymn of Ox. by calling it "an attempt at Christianizing Greek musical forms" (in the Appendix on Music to *Abriss der antiken Geschichte*, ed. S. Lauffer, München <sup>2</sup>1964). He too still adheres to the theories of Meyer.



 $\hbox{Musical Evenings in the Early Empire: New Evidence from a Greek Papyrus with Musical } \\$ 

Notation

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# MUSICAL EVENINGS IN THE EARLY EMPIRE: NEW EVIDENCE FROM A GREEK PAPYRUS WITH MUSICAL NOTATION

WITH disarmingly open conceit, the Younger Pliny tells Pontius Allifanus that 'my hendeca-syllables are read, are copied, are even sung, and Greeks (who have learned Latin out of love for my poetry book) make my verses resound to cithara and lyre' (*Epist.* 7.4.9). By Pliny's time, Greek musicians (and actors) were widely distributed and organized in a worldwide guild centred at Rome, 1 so it will not surprise us that Greeks are the ones setting the verses to music. But what sort of music? When Pliny went out to hear his beloved poems sung to cithara and lyre, what did it sound like? Or, more generally, what did Pliny, or Martial, or, in an earlier generation, Horace see and hear when out for an evening's musical entertainment at the hands of a Greek troupe? Until fairly recently, we have known precious little. Literary sources give the odd anecdote, such as the reports of Nero's performances, but in general tell us little specific about the content or style of musical entertainment in the Roman era. And sources speaking more technically about music itself lend the impression that nothing significant happened after the 'New Music' was introduced in the fourth century BC.<sup>2</sup>

Over the last several decades, however, a thin yet steady trickle of documentary finds has gradually allowed us a much firmer impression of what Greek musical entertainment was like in the Roman era. The documents stem from the provinces, especially from Graeco-Roman Egypt, but the fact of worldwide guilds of travelling musicians encourages us to think that settings and styles are broadly representative. The most spectacular finds, such as the Seikilos epitaph, the Berlin 'Music Lover's Library', or the Oxyrhynchus Christian hymn, have long been known, but in the last fifty years each decade has seen the steady addition of newly published documents, mostly from the Roman era, mostly scrappy, but as a group highly significant. To be sure, the number of ancient witnesses remains small: a complete catalogue (including Hellenistic documents) lists two short collections passed through the medieval tradition, five inscriptions, 23 papyri.<sup>3</sup> Even these are often very fragmentary and difficult to interpret: we hear broken snatches of melody here, an uncertain rhythm there. But enough now exists for a determined and insightful scholar to begin to draw conclusions, and this is exactly what a landmark study by M.L. West, Ancient Greek Music, has recently done. For the first time, a history of ancient Greek music can begin not from speculation based on ancient theorists, but from how extant examples, however exiguous, illustrate and augment what can be culled from literary and technical sources. Roman-era documents can be used to demonstrate, for instance, that Greek music in the time of Horace or of Pliny differed sharply from the 'ant hills' of Timotheus.<sup>4</sup>

Now a small but extremely interesting papyrus fragment in Yale's Beinecke Library can be added to our evidence. *PCtYBR* inv. 4510, a Roman-era fragment containing parts of (probably) two Greek melic poems with running vocal musical notation, supplements our detailed knowledge of ancient Greek music in a number of ways: the papyrus significantly extends our notion

<sup>&</sup>lt;sup>1</sup> By imperial decree, dating from the time of Augustus and consolidated under Claudius. Essential documents are *BGU* 4.1074, *POxy* 27.2476, 31.2610; *cf.* discussion in Pickard-Cambridge (1988) 297–8; and on the *technitai* generally, *ibid.* 279–305. Garton (1972) 141–67, esp. 151–6, 166, gives a vivid account of Sullan interactions with local Greek guilds as antecedent to the Augustan and Claudian action.

<sup>&</sup>lt;sup>2</sup> See West (1992a) 373.

<sup>&</sup>lt;sup>3</sup> West (1992a) 277–83 is the most complete catalogue to date. That catalogue is arranged by the number of different pieces of music rather than by the number of documents, hence the difference in our counts (West lists a total of 51 scraps of music). The Oxyrhynchus pieces listed there as unpublished have now been edited by West (1998), as numbers 4461–7 in *POxy* LXV; and in West (1999), a collection of small Ptolemaic scraps, now reported as from the Fayûm. West and Pöhlmann are presently collaborating on a revision to Pöhlmann (1970), formerly the standard corpus for the musical documents.

<sup>&</sup>lt;sup>4</sup> West (1992a) 356–85, esp. 384.

of what a dramatic leap down a scale might entail, or what range might be demanded of a vocalist; here is our most extensive witness on papyrus of the form and use of triseme (marking a note of three basic time-units); this is the only document to contain certain musical notes towards the bottom of the scale, including one note outside any known notation key; and the papyrus adds precious evidence for our understanding of the notation of rhythm.

For non-specialists the primary importance of the Yale papyrus will lie, however, not so much in the richness of new details, but in its accumulation with a group of papyri that increasingly looks like a type. The better preserved of this group, all musical papyri of the second or early third century AD, are *POxy* 2436, *POslo* inv. 1413, *PMich* inv. 2958, *PBerol* inv. 6870. With these the Yale papyrus shares several distinctive characteristics: (1) unusual formal features of the roll, such as the odd column layout (see §2.2); (2) an ornate musical style, with free use of melisms (two or more notes set to a single syllable), but coupled with a fairly strict diatonic scale; (3) a heavily mythological content informed by a 'dramatic' personal voice, as indicated by markers like vocatives, imperatives, conjunction of first and second person, and an overall melodramatic tone; (4) indications that the roll contained a collection of two or more different songs (*POxy* 2436 is too fragmentary to exhibit this feature). Less regularly, and doubtfully in the Yale papyrus, we see also: (5) stichic verse, in whole or part, such as iambic trimeter or trochaics (and *cf.* Pliny's hendecasyllables!), which we expect to be spoken but which are set to music. Less extensive fragments, such as *POxy* 3704, 3161, 3162 (and now *POxy* 4461–7), are also mostly or wholly consistent with this portrait.

Shortly after the initial publication of PBerol inv. 6870, Mountford tagged it the Berlin 'Music Lover's Library', behind which was a vision of an anthology collected by a private person 'for purposes of instruction or pleasure'. Mountford went on to infer that the contents were 'presumably pieces which had considerable notoriety, and ... are more likely to be selections from comparatively standard works than contemporary favourites'. But the accumulation of other such 'anthologies' allows us to draw a very different, and less speculative, portrait of what a fragment such as the Berlin papyrus, or now the Yale papyrus, may represent. First, the unusual and yet consistent formal features of the texts can be used to confirm what some have already inferred from the fact of the musical notation:8 that these papyri are almost certainly musical texts which were produced for, and sometimes by, professional musicians (detailed arguments below, §2.2). The excellent publication of the Oslo papyrus gave us our first secure push in this direction, for there the writer of the musical notation seems to be the composer himself.9 Secondly, the music of these papyri shows every sign of 'late' composition: in the whole group there is hardly a hint either of the enharmonic genus expected in Classical music, or of the sort of chromaticism and modulation expected of New Music. Thirdly, there is the 'dramatic' content combined with the fact of an anthology, for which again the Oslo editors first made plausible the argument that papyri of this sort may well represent the arias (as it were) of a star performer.<sup>10</sup>

The Yale papyrus joins, then, a group of papyri that bear witness to what a Roman-era Greek musical performance was like. How can we describe this performance? First and foremost, florid and dramatic, and highly so. These characteristics are also found in classical melic poetry, but the Yale papyrus even in its brief and fragmented form displays an unusually rich array of

<sup>&</sup>lt;sup>5</sup> Earlier musical documents which are also probably anthologies: *PLeid* inv. 510, two lyric excerpts from the *Iph. Aul.* presented in a sequence different from their occurrence in the play; *PVindob* G 13763 + 1494, vocal music with instrumental interludes; probably also *PVindob* G 29825 a–f (dramatic fragments).

<sup>&</sup>lt;sup>6</sup> Other musical stichic texts beyond the group considered here: the Epidaurus inscription (hexameters: see West (1986)); Mesomedes, *Hymn to the Sun* and *Hymn to Nemesis*.

<sup>&</sup>lt;sup>7</sup> Mountford (1929) 152.

<sup>&</sup>lt;sup>8</sup> See Comotti (1991) 11, 41; West (1992a) 269–73.

<sup>&</sup>lt;sup>9</sup> Winnington-Ingram (1955) 56–8.

<sup>&</sup>lt;sup>10</sup> Eitrem and Amundsen (1955) 27–9.

poetic and melodic adornment: repetition and even rhyme in the poetry, frequent melism and rare but wide and dramatic leaps in the melody line. At one point the singing even seems to imitate, by a wild plunge into the bass, the shift in voice characteristic of spirit possession (see §3.1). The poetic contents are similarly ornate: in the few whole words that come down to us, there are in the first column several mythological allusions (Muses, Tempe(?), 's/he who delights in the bow') along with pregnantly dramatic declarations ('I will taste of your...', 'I will proclaim the prophecy...', 'I will fill the altar...'); and even in the exiguous second column, weeping and wailing come quickly into play. Furthermore, use of first and second person in the Yale papyrus, like others in the group, suggests a dramatic scene, and indeed a scene mostly or entirely played by a single singer.<sup>11</sup> That suggests in turn acting and spectacle, but here we stumble into a hole in our knowledge that the documentary evidence will not fill. The ornateness and high drama are in any case consistent with the idea of the star performer. Here is a show piece, a vehicle for a performer to strut his stuff, the ancient equivalent of 'Un bel di vedremo'. And one must insist that the cultural register is Puccini and not pop: the frequency of mythological allusion in the Yale papyrus and in the group as a whole strongly suggests an audience with pretension to cultural attainment. This is music pitched at the upper crust and the 'wannabes', and not at the bakers and fullers.

I have already mentioned that the music in the Yale papyrus, and in the group as a whole, distinguishes itself from music of Classical or early Hellenistic times, for behind a superficial ornateness is a thoroughly diatonic scale. This does not mean that the music cannot itself be a few generations old; but that it stretches back to the time of Timotheus or Euripides is unlikely, and the presumption here will be that the music is more or less contemporary. The poetic text need not be. First, the metre seems to be dactylo-epitrite, and this apparent fact (see §3.3) may suggest that the poem (as opposed to the music) is not contemporary. At least one can say that, on the thin evidence we have, dactylo-epitrite seems to have fallen out of favour by the second or first century BC. In this context one thinks, too, of the Themison inscription, which is often adduced as evidence for the habit of setting the old poets to new music. For that second-century AD inscription celebrates the singer Themison, who won many prizes by setting Euripides, Sophocles and Timotheus to his own music.<sup>12</sup> The poem here is not, however, by Sophocles. Or at least I find it hard to imagine attaching this contrived style to what we know of the Classical tragedians. Indeed, what is so interesting about the piece is that it seems to be something so very new, a piece of melodrama rather unlike anything that comes down to us through the medieval manuscripts.

What kind of musical poem do we have then? Editors of musical papyri are prone to declare the pieces fragments of scenes from drama. At least some of the papyri certainly are that: one thinks of the Orestes fragment, and of the collection of arias excerpted from the *Iphigeneia at Aulis* in a Hellenistic musical fragment (*PLeid* inv. 510). The Yale papyrus may then be scenes from tragedy, recent or old, set to contemporary music. But it is important to bear in mind that this conclusion is presumptive—for the melodramatic content of our fragments does not necessarily imply drama *per se*. Many generic forms, from monody to choral lyric to mime, contain similarly dramatic settings. As the anecdote from Pliny will serve to warn us, the contemporary habit seems not so much to set canonical dramatists to contemporary music, as to sing the 'best' poetry available. The assumption that documents such as the Yale papyrus contain excerpts from tragedy may then be too facile, and we should hold open the real possibility that these melodramatic songs represent a category otherwise unknown to us.

<sup>11</sup> Soloists were accompanied by one or more instrumental players, who (given their designation as ὑποκριταί) may also have acted minor parts; see documentary evidence collected in Eitrem and Amundsen (1955) 28. Among the musical papyri, only the Michigan papyrus provides direct evidence of a dialogue, and there too a lively, self-questioning monologue cannot be ruled out. For a reconstruction of the Michigan piece as a dialogue, see West (1992a) 315.

<sup>12</sup> μόνον καὶ πρῶτον Εὐρειπίδην Σοφοκλέα καὶ Τειμόθεον ἑαυτῷ μελοποιήσαντα (SEG 11. 52c, add.).

<b>§</b> 1	<b>§</b> 2	<b>§</b> 3
Transcriptions	Text	Music
1.1 Diplomatic	2.1 Palaeography	3.1 Melodic Notation
1.2 Poetic Text	2.2 Format and Context	3.2 Rhythmical Notation
1.3 Modern Staff Notation	2.3 Contents and Style	3.3 Metre and Accent

### §1. TRANSCRIPTIONS

PCtYBR inv. 4510 was acquired by the Beinecke Rare Book and Manuscript Library in 1996 (PLATE 1). The acquisition was one of three purchases (labelled 1996b, 1996c and 1997a in the Beinecke records) represented by the dealer as parts of a single private collection. The collection is said to have been purchased from Egyptian dealers earlier in the century, but otherwise nothing is known; and, since the materials in the collection are various (ranging from the Ptolemaic era to the Byzantine, and stemming from several nomes), nothing more concerning provenience or date can be inferred from external circumstances.

In the transcripts below, + indicates musical notes that cannot be read, and  $\square$  indicates a space of about a letter's width left blank in the poetic text. Writing runs along the fibre, on papyrus of apparently fair (not fine) grade. The back is blank. As often in the musical papyri, the poetic text was written first by one hand, and the musical notation added later by another. That second hand is also responsible for the corrections at i.4 and i.9.

#### §1.1 Diplomatic Transcription (see opposite)

**Text:** Song A (= Col. i.1-ii.5). Col. i.3 ]τ, or  $\pi$ . 4 ] $\pi$ , or  $\gamma$ , τ. 4 Above and following  $\alpha$  of  $\alpha \sigma \omega$  possibly *iota* written in correction; see note on musical notation at i.4.7. 4corr. Trace visible of lower left angle of, it seems, *delta*. 8 ]τ, or  $\gamma$  with horizontal intrusion from the preceding letter.

9 To either side of  $\alpha$  cancellation dots, perhaps also a cancelling slash. Correction by the hand responsible for the musical notation. Col. ii.5 In the intercolumn at left the second hand has added a paragraphos, on top of which is positioned a large and rather crude *chi-rho* siglum. 5  $\pi$ [, or  $\tau$  followed by a rounded letter like 0,  $\varepsilon$ ,  $\omega$ ; less likely  $\alpha$ .

Song  $B \ (=Col.\ ii.5-ii.10)$ . Col. ii.6  $\lambda$ [, or  $\delta$ ,  $\mu$ ,  $\chi$ . 7  $\eta$ [, a very difficult reading: among other possibilities are  $\gamma$ , or  $\iota$  followed by another letter;  $\nu$  very unlikely. 9 At right, perhaps the left tip of the bowl of  $\alpha$ ? 10 The blank space is slight, perhaps accidental.  $\tau$ [, or  $\pi$ .

Musical notation: Song A. Col. i.2.1-5 Marks above these notes (diseme, triseme or stigme) would be in lacuna. 2.1 Hasta looks more like lower part of  $\phi$ , but traces at left and the placement of the note suggest 7. 2.2 Perhaps χ. 2.3 Bare trace of two vertical strokes, and speck of a rounded 2.4 The sigma is oddly formed, but the surface is damstroke at bottom, consistent with e.g. o or ω. aged and sigma is musically easy (a fourth); the remains resemble, however, the similarly damaged (and  $2.8 \tau$  just possible; stigme only probable. 3.5 What appears as a dot intractable) strokes at i.4.1. above and to the right is, I think, transient ink. 3.10 The diseme is unusually short: stigme intended? 4.1 Very difficult: perhaps o or c, with stigme to upper right, and hyphen connecting with the previous stroke? If so, then the note belongs with the previous syllable. 4.2 Uncertain to which syllable this note belongs, but (aside from the problem of too many notes over one syllable) more naturally read with following  $\delta \omega v$  than preceding  $\pi o$ : the position of a musical note varies from over the vowel to over the first letter of the syllable, but nowhere else falls so far to the right of its syllable. 4.7 Remains of the top and bottom tip of a vertical stroke, and to the left a rounded stroke. Perhaps  $\phi$ , though if so awkwardly fashioned. Also possible that the remains are of a note and an iota added in correction to the text. 4.8 Ductus clearly suggests  $\tau$ , but an awkward c cannot be excluded and seems musically superior. 4.9 Above the line, intruding into the tau of 4corr., is a second dot, conceivably the upper dot of a dicolon, but more likely stray ink. 4.11 Not certain, but it appears that the note was cancelled with an

```
Column i
                                                     Column ii
         ] .. [
    1 2 3 4 5 6
    1' + + c' \oplus 1 \quad 1 \quad 1'
2]φαριαναρκις ς ον ε
   1 2 34 5 6 7 8 9 10

Τ φ' co on τ φ χ c
                                                               ]+[
3]τεκρατης ωτοξαταλη
                                                   cαcαπαρθε[
                     ф т <del>х</del>
                    δετακαςταλιδων
      יו ד χ+
4 ]ποδωνςωναςω [κλω]
                                                   τα ς η δον α[
     \frac{1}{4} \frac{3}{\chi} \frac{4}{1} \frac{56}{1} \frac{7}{1}
                                                   1 2 3 4 5 6 7 8 9
                                                   ικο κι z :λ 20
5 ]ς ακαιγευς ομαις ων
                                                  νη οσοσο π[
  1 2 34 567 8 910
+ 3 : 9w : 9w + +
                                                     Z
6 |ριχαμαντευςομαι
                                                   μουςικαλαλ[
  1 2 3 4 5 6 7 8 9
  τ φ c' ο' ι' <del>[</del>፲' Ζ ι'
                                                          :a 0 0 a
7 ]ενετοξοχαρηθηρο
                                                   cαικλαιειη [
    1 2 3 4 5 67 8
O C O C φ : <del>φ</del> φ
                                                    1 2 3 4 5
                                                   :1 à à ∪ 1°
    ]τατεμπεαθηρο
                                                   μυρομενη[
 + c :c'o o :con co
9] α΄ ελαγους μαλλον
                                                   αςορνις 🛮 αλλ [
    1 2 3 4 5 6 7 8 9
                                                    φ ο τ<sup>2</sup> +
   : \chi^2 \varphi^2 \cap \overline{\chi_2} \varphi \subset \chi \varphi
10 ]πληςωβωμονεγω
                                                   γυνη □ ποτ[
       foot
                                                       foot
```

oblique stroke. 4.12  $\phi$  is written to the right of the syllable to avoid the trailing tail of 3 from the text line above. 5.5 All that remains is, apparently, a horizontal stroke, consistent with e.g.  $\tau$ , c. 6.1 Tip of upper oblique, as e.g.  $\chi$ ; elongated stigme also possible. 6.2 Stigme faint and uncertain.

6.8 Speck at bottom as though the tip of a hasta: another  $\ref{eq:continuity}$  6.9–10 No continuity between the horizontal strokes of these two notes. 6.10 The papyrus surface is rubbed where one expects the left upper diagonal of the asterisk. 7.2 Faint dot at upper right, possibly stigme. 7.5 Upper part of hasta visible; since no remains of hasta at bottom,  $\iota$  rather than  $\varphi$ . 7.6 Badly damaged but the oblique tip at lower right suggests  $\chi$  or  $\kappa$ , the latter perhaps more to be expected musically, the former better palaeographically; but other notes, even including  $\iota$ , cannot be excluded. 8.7 Sigma awkwardly formed (the lower stroke does not quite meet the upper) but fairly certain. 9.9–10 Above and to the left is a speck, perhaps

stray ink, possibly stigme (though in an odd position), or possibly the remains of a diseme—the papyrus is stripped exactly where the diseme stroke would lie, though one would expect to see some trace of the diseme at the right. 10.1 Only the lower dot of dicolon remains. χ is partial, but fairly certain.

10.2 Remains are confused, but the long lower hasta strongly suggests  $\phi$ . 10.5 z surprises: could this be a mistake for 7 (paired with  $\chi$  at 4.3–4, 5.3–4)? 10.8 A stray bit of papyrus stuck to the surface may obscure a stigme above this note. ii.4.1 The apparent stigme is faint and oddly positioned, and may well be stray ink: there is some blotting in the area following the correction to i.4. 4.4–5 Left edge of diseme or triseme; stigme would be in lacuna.

Song B. Col. ii.7 In intercolumn at left a large ink blob, probably accidental. 10.3 Or z; surface abraded where stigme would lie.

## §1.2 Poetic Text

```
Column i
1
               ] . [
2
       ]φαρ, ἴα, νάρκις τον ε-
3
       ]τε κρατήςω τόξα τὰ λη-
4
       ]ποδων ςῶν, ἄςω \ δὲ τὰ Καςταλίδων / [[κλω]]
5
       ] καὶ γεύς ομαι ς ῶν
     τ]ρίχα μαντεύςομαι
       ]ενε τοξοχάρη θηρο-
           ]τὰ τέμπεα θηρο-
9
      ]·α·\π/ελαγους μᾶλλον
       ]πλήςω βωμὸν έγὼ
```

[Song A] ... <sup>2</sup> [oil?,] violets, narcissus ... <sup>3</sup> I will hold a bow (of the child of Leto? / tender?) ... <sup>4</sup> (before?) your (feet?), and I will sing the [...] of the Kastalian nymphs ... <sup>5</sup> and I will taste of your ... <sup>6</sup> (hair? / in three ways?) I will proclaim the prophecy ... <sup>7</sup> (O maiden?) you who delight in the bow and [in killing?] the wild beasts ... <sup>8</sup> Tempe (the valley) ?where the wild beasts [are born (vel sim.)] ... <sup>9</sup> (of the sea? / the hares?) rather than ... <sup>10</sup> I will fill [up?] the altar ...

[Song A] Col. i.2 For the mix of (plural) violets and (singular) narcissus, cf. HH Dem. 6-8 (a reference I owe to M.L. West): [Persephone] ἄνθεά τ' αἰνυμένην, ῥόδα καὶ κρόκον ἠδ' ἴα καλὰ / λειμῶν' ἂμ μαλακὸν καὶ ἀγαλλίδας ήδ' ὑάκινθον / νάρκισσόν θ', ὃν φῦσε δόλον καλυκώπιδι κούρη / Γαῖα...; at Longus 3.12.2 a list of spring flowers includes ἴα καὶ νάρκισσον; similarly at App. Anth. sepulcralia 238.3, a list of funereal flowers. On contexts for the common pairing of narcissus and violets, see below §2.3. If ἴα is correct, then the almost inevitable restoration is ἄλει]φαρ, an oil or unguent (in this context perhaps a perfume?). For e.g. ῥόδινον ἄλει $\varphi\alpha(\rho)$  as a variant for the common ῥόδινον μύρον, cf. Hipponax 58 Bergk, and in Hippocratic prescriptions for women, de nat. mul. 74, de mul. affectibus 84, 195, 206. Many types of flowers are used in unguents (including the narcissus: for illustrative lists, cf. Aëtius Amidenus Iatricorum liber xvi 83 Zervos; Hierophilus Soph. in Delatte, Anec. Athen. 460), but unguent is in any case appropriate if, as it seems, this is a list of gifts or offerings. The repeated mythological allusions at first tempted me to think of the boy Narkissos, but ]φαρ ια νάρκισσον surely suggests the flower (hard to see how iά, 'arrows', would work alongside narkissos, despite the bow in the next line); and other interpretations of ]φαρια are not attractive (rare and not obviously suitable are ψα]φαρία (dust, dirt), γομ φάρια (mullets, but used proverbially of overly honest people), φαρία (an obscure sort of vessel, or adjectival for the island Pharos); φάρια (plural diminutive of φᾶρος); and the division ]φα ρια is hardly better).

3 τόξα: the trace below the line at the left seems to guarantee ksi. For κρατέω with accusative of the thing one holds (has mastery over) see LSJ IV.5; and cf. Theocritus, 23.4f: κοὐκ ἤδει τὸν Ἔρωτα τίς ἦν θεός, ἀλίκα τόξα / χερσὶ κρατεῖ, χώς πικρὰ βέλη ποτικάρδια βάλλει.

τὰ λη[: Given probable references to Apollo or Artemis in what follows, perhaps τόξα τὰ  $\Lambda\eta$ [τογενοῦς or  $\Lambda\eta$ [τοίδαο (-ου). A different word division is however possible: τόξ' ἀταλὴ or ἀταλῆ (χερί?).

4 ]ποδων σῶν: the word order suggests high (tragic?) style: cf. e.g. Eur. Ph. 695 (ποδῶν σῶν), Aesch. Pr. 557 (λέχος σόν). Perhaps πρὸ ποδῶν σῶν? For the motif of suppliants setting holy wreaths 'before your feet', cf. Achaeus Trag. fr. 2 Snell. Or, as M.W. Haslam suggests, perhaps τρι]πόδων σῶν (a familiar item at Delphi).

ασω: Cf. Theocr. 1.145 for a similar context. An adscript internal to the stem is usually written in Roman-era literary texts (thus αισει in a Theocritus papyrus, POxy 50.3548, vii.78), but not always. Both syntax and context here seem to demand ασω over αω.

For the Muses as Κασταλίδες (νύμφαι), *cf.* Theocr. 7.148, and, if Schubart's restoration is correct, an epigram by Posidippus Pellaeus, *SH* 705.8; also *Castalis, Castalidum* at Martial 9.18.8, 4.14.1. A word otherwise unknown. In Roman times Kastalia and prophecy become closely linked: *RE* 10.2338.

κλω was erased in antiquity, and the musical note above it apparently cancelled with a slash. The fact of its erasure implies that more text (and music), ending in κλω, is added supralinearly above the next line. In the context, κλω [να δάφνης seems very likely, as M.L. West points out to me, adducing Lucian adv. indoct.  $3 \pi \alpha \rho \alpha \tau \omega \sim 10^{-10} \text{ Mous} \sim 10^{$ 

6 μαντεύσομαι can mean 'I will proclaim a prophecy' (whether a man or, in Hellenistic Greek, a god declares the oracle: LSJ s.v.), 'I will consult the oracle' (e.g. Pindar, Pyth. 4.163), 'I will proclaim s.o. a (god sim.)' (e.g. AP 14.69.3). Further at §2.3.

7 ] eve strongly suggests a vocative, and given what follows  $\pi\alpha\rho\theta$ ] éve seems likely.

τοξοχάρη: Formally one expects τοξοχαρῆ, accusative, but in the immediate context the word seems more likely intended as vocative (a suggestion I owe to M.L. West). Examples of 3rd-declension s-stem nouns and adjectives with vocative in -η do occur sporadically in Roman-era papyri and inscriptions (Gignac (1981) II.137; Threatte (1996) II.178; *cf.* Schwyzer *Gr. Gramm.* I 579–80, who accents paroxytone). The phrase παρθένος τοξοχαρής would paraphrase exactly παρθένος ἰοχέαιρα (by its ancient etymology, > ἰός + χαίρω), a standard name for Artemis (e.g. *HH Art.* 2). τοξοχαρής does not occur in extant ancient Greek, but the compound is obvious enough to arise in an archaizing twelfth-century poem by Nicetas Eugenianus ('Drosilla and Charicles' 4.181, 5.383 Conca; referencing Eros).

θηρο[: the poet here adds another epithet, as e.g. θηρο[κτόνε, θηρο[σκόπε. For discussion of possibilities, §2.3.

8 τ]ρίχα: poetic for prose τριχῆ, as commonly in the tragedians and elsewhere (in the context of prophecy, cf. Herodotus 4.67). Or accusative of θρίξ? (Wetting hair in Kastalia's waters is a part of ministrations to Apollo at Euripides, Ph. 222–5.)

Ε.g. τὰ τέμπεα θηρο[τόκα (cf. *AP* 6.186 ἄγκεσι θηροτόκοις); other possibilities include θηρόβοτα, θηρονόμα, θηροτρόφα, θηροφόρα.

- 10 ]πλήcω βωμὸν: For the syntax, cf. Plato, Leg. 7.814b, Libanius Or. 17.4, App. Anth. oracula 81.15, and for the thought cf. AP 10.7.5 ff. [Archias].

[Song B] Col. ii.5 The marginal siglum seems intended to mark a division, given the horizontal line (which the ancient reader will recognize as a paragraphos). Why the second hand has superimposed a chirho on top of the paragraphos is less clear. Chi-rho is usually taken as either  $\chi \rho(\hat{\eta} \sigma \iota \varsigma)$ , a new or quotable 'passage', or χρ(ηστόν), χρ(ήσιμον), meaning 'useful', that is, something noteworthy in the text. The most recent and thorough study of such sigla concludes, however, that the first option is a red herring, and that all instances on papyri mean, in essence, something 'useful': McNamee (1992) 20-1. If true, then the complex siglum here would have to mean something like 'a noteworthy new entry'. But that seems close to the traditional interpretation of  $\chi \rho(\hat{\eta} \sigma \iota \varsigma) = a$  new or quotable 'passage', for which McNamee herself gives convincing evidence on the semantics (21 n.71) as well as examples where the siglum occurs in conjunction with quoted passages and the like (21 nn.69, 72). I should think it best to revert to McNamee's earlier view (McNamee (1981) 109 n.81), shared by Turner and Parsons (1987) 15, that the chi-rho is used generally to mark noteworthy items, but is also used more specifically to mark quoted or quotable passages. Here, then, I believe the siglum is intended to mark a new excerpt, that is, a new song in the anthology; and this rather than  $\chi(000)$  may be also what is intended in another musical papyrus, PVindob 29825ab, line 6, where a similar overlarge chi is written in-line; or even in the Berlin papyrus where AAAX introduces the second vocal piece. But other anthologies seem content with the paragraphos alone (cf. e.g. PTebt 1.1; BKT III 542), or use markers such as vertical space or ekthesis (for which see esp. the scrappy remains of musical anthologies at POxy 4461, 4464, 4467.)

That the song ends at the blank space internal to ii.5 is not certain, but seems probable given the blank space used as punctuation at ii.10. That probability increases with the observation that there is no indication that the scribe who produced the lines of poetic text did so with any knowledge of the music to be superimposed on those lines (details at §2.2). The blank space is therefore best taken as a mark of a major division, as commonly in prose layouts, rather than as space left to accommodate the music.

- 6 Perhaps some form of λαλέω (of musical sounds, Theorr. 20.29 and LSJ s.v. III), given the traces and the context. But dotted *lambda* is very uncertain.
- 7–9 The conjunction of weeping, wailing and bird(s) suggests the Procne and Philomela tale, though nothing can be proven; but at Euripides Ph. 1514, with reference to the same tale, we find a similar (though not identical) conjunction of μύρομαι, κλαίω, ὄρνις. Tereus appears in another very fragmentary musical papyrus, in which λάλει, μύρομαι also occur: POxy 3161 $\rightarrow$  1.5, 4.5. The lamenting nightingale is a favourite theme of Greek song: some examples in Barker (1987) i.63–5, also 65 n.9 for other lamenting birds.
- 9 ]ας, unless the relative, must be preceded by a vowel. Given ]ας and the diseme over the final syllable, ορνις may be accusative plural (ὄρνῖς for ὄρνεις, as often in the tragedians and elsewhere [LSJ s.v.]; or an itacistic scribal spelling). The phrase here overlaps with Sophoclean fragment 791 Radt (κοκκυβόας ὄρνις), but, since the letter sequence is not rare (68× in the TLG data bank, CDROM D 1992) and nothing else suggests Sophocles, we should surely chalk this up to coincidence.
- 10 The slight space following γυνη may be incidental (cf. the slight gap following  $\kappa\alpha$ i, certainly not punctuation, at i.5). But if deliberate, perhaps (M.W. Haslam's suggestion) πότε interrogative?

#### §1.3 Modern Staff Notation

I set forth below a best-guess approximation into staff notation, using the conventional equivalents for the notes (about a minor third too high, by the current consensus).<sup>13</sup> Warning: I smoothe over the many difficulties of the papyrus with a heavy hand, thus transcription and commentary remain the fundamental text. A vocal rendition, likewise approximate, can be heard by visiting the University of Cincinnati web site at http://classics.uc.edu/music/yale; or by locating the papyrus in the Beinecke catalogue (http://www.library.yale.edu/beinecke).



<sup>&</sup>lt;sup>13</sup> See West (1992a) 273-6.

#### §2. TEXT

### §2.1 Palaeography

The poetic text is written with graceful informality in upright, markedly bilinear, rounded capitals by a well-practised, medium-speed, and very probably professional hand. Musical notation and corrections were added later by a different, more casual hand in a darker ink and with a coarser pen. Text corrections also belong to this second hand. The second hand is practised and comfortable with writing, but shows the irregular letter formation, uneven alignment and inconsistent ink control associated with private hands.

The script of the poetic text falls into the class called by Turner 'informal round', though the designation seems to understate the elegance of appearance frequent among these scripts. <sup>14</sup> Scripts of this type are usually assigned to the late first or early second century AD. Comparing *PLitLond* 132 (= C. Roberts, *Greek Literary Hands*, #13b), dated by the palaeography of cursive annotations to the early second century AD, and given the affinity of the musical notation to second-century scripts, I think the Yale papyrus best assigned to the early part of the second century.

§2.2 Format and Context

dimensions:  $13.0 \times 14.2 \text{ cm}$ letter width: 0.44 cm (average)column:  $>7.0 \times >13.0 \text{ cm}$ leading: about 1.3 (1.1-1.4) cmintercolumn: 1.8-2.0 cmkollesis: at 6.5 cm from left top edge,

upper margin: not extant overlap of c. 2.0 cm

lower margin:1.2 cm (possibly complete)disposition: written along the fibres,letter height:0.25 cmpresumably the front; back is blank

At first glance, the mise en page may seem very much that of an ancient book roll. Or so argue the fairly formal 'book hand', the regular horizontal and vertical spacing of the text, the division into columns justified right and left, the narrow intercolumn of approximately 2 cm, the fresh papyrus of decent quality written along the fibres. But whether an ancient reader would have viewed this papyrus as a book roll in the same sense as a roll of Aeschylus or Demosthenes may be doubted. Aside from the obvious-that the papyrus was written with specially large vertical spacing to accommodate the musical notation-the oddness of the column itself draws the reader's attention. By the date of this papyrus, a book roll of Greek melic poetry was typically written with the cola on separate lines. 15 The justified right margin and narrow intercolumn of the Yale papyrus would suggest a prose text to a contemporary reader. Yet a column of prose typically has a width of 4.5-7.0 cm, and hardly ever exceeds 7.5 cm. 16 The lines here are of course incomplete, but as it stands the width of the damaged left column is 7 cm, and the text in lacuna must be substantial. In lines 3-4, for example, |ποδων σῶν requires some construction to occasion the genitive, and needs considerably more to connect it to what precedes; or in lines 5-6, σῶν must be followed by a noun, and at a minimum we need a conjunction to tie that phrase with what follows. Given such parameters, it is hard to imagine restorations of less than ten letters per line for the first column, and the size of the lacuna may be substantially greater. All of this calculates to a width of 11 cm or more, a width strikingly beyond what is usual for a book roll with justified columns.

The production has, then, an idiosyncratic appearance. To the ancient reader, this is occasioned not simply by the presence of musical notation: the very look and feel of the layout strongly differentiates this roll from a typical poetic or prose book. If poetic, the lines should be

<sup>&</sup>lt;sup>14</sup> See Turner and Parsons (1987) 21. Though 'informal' is strictly correct, these rounded capitals have many points of contact with calligraphic majuscules of great formality (as Turner himself notes).

<sup>15</sup> Turner and Parsons (1987) 12.

<sup>&</sup>lt;sup>16</sup> Johnson (1992) 167–73, 242–5, 253–8.

ragged on the right with a more substantial intercolumn; if prose, the columns should be narrow, much narrower than likely here. But a look at the other musical papyri immediately changes this picture. Whereas one will look far and wide among other literary papyri to find a parallel for this column layout, the few musical papyri offer a number of close analogues. Following is a list of papyri with music notation where there are substantial data for the column layout.

PVindob G 2315 3rd cent. BC (Orestes). If Turner is right that this text is not colometrized (see Turner and Parsons (1987) 150 n.79 and the reconstruction in West (1992b) 1), then the full column width was about 15.5 cm.

PLeiden inv. 510 3rd cent. BC (Iphigeneia in Aulis). Lines of long but apparently uneven length (48 then 62 letters), approximately 21–7 cm wide (a rough estimate inferred from the photo in Matthiesen (1981) 24 and the report of the papyrus dimensions given in Jourdan-Hemmerdinger (1981)).

PZenon 59533 3rd cent. BC. Apparently an exercise or the like; but written without colometry to a column width of >12 cm.

POxy 2436. Early 2nd cent. AD. Written without colometry, columns justified; column ii width >12 cm.
 POslo inv. 1413. Early 2nd cent. AD. Written without colometry, columns justified; column width >15 cm. Turner (at Turner and Winnington-Ingram (1959) 113) estimates a column width of 21–2 cm on the basis of the editors' restoration of line 9.

PMich inv. 2958. Early or middle 2nd cent. AD. Perhaps written without colometry. Column width >18 cm.
POxy 3704 2nd cent. AD. Codex or opisthograph. Perhaps colometrized. Column width >11 cm wide.
PBerol inv. 6870. Late 2nd or early 3rd cent. AD. Written without colometry to a width of >17 cm (measured for the first excerpt).

POxy 1786. Late 3rd cent. AD. Written on a reused scrap, to a complete column width of about 30 cm.

The fact that the musical papyri are written to a wider column has long since been remarked,  $^{17}$  but it is worth stressing both how unusual this format is, and how much of a type. The columns are usually written without colometry as if prose, and are uniformly very wide: 15.5, 21–2, 30 cm are estimates or measurements for complete columns, and among partial columns three measurements exceed 15 cm. Not only are these widths dramatically beyond the 4.5–7.0 cm typical of prose texts: the columns are also wider, and sometimes much wider, than the ragged lines typical of poetic texts, whose column widths tend to a range of c. 8–12 cm for drama, or 10–15 cm for hexameters (and with a wider intercolumn of c. 3–4 cm).  $^{18}$ 

Clearly the format of the Yale papyrus is occasioned not simply by a unique event in which the customer handed a text to a scribe and requested that the lines be double-spaced. Instead, we find ourselves confronting a different, highly specialized idea of a 'book' (or, given its probable short length, 'pamphlet'). That the format was in some sense determined by the needs of the reader becomes yet more apparent as one tries to think through the way in which a roll such as the Yale papyrus would have been produced. It seems unlikely that the customer had a model roll with musical notation which the scribe was asked to copy in identical format. For, like several other extant examples, the Yale papyrus has the text written by, apparently, a professional scribe and the music by, apparently, a private hand, presumably the owner. It is of course not impossible that the scribe was given a book with both text and musical notation and asked to copy the text but not the music. But economy of hypothesis argues against it, and this scenario will be impossible for a text like *POslo* inv. 1413, where the text is written first (though whether by a professional hand is harder to say) and the music added later with corrections that strongly

<sup>&</sup>lt;sup>17</sup> Turner and Winnington-Ingram (1959) 113.

<sup>&</sup>lt;sup>18</sup> Johnson (1992) 178–80, 259–60, 263–7.

suggest that transcriber and composer were one and the same.<sup>19</sup> In some cases then, and I think probably in the case of the Yale papyrus, the text alone was handed to the scribe, which will mean a text in the usual more narrow, colometrized format,<sup>20</sup> and the scribe was instructed to copy it in a format which to him would have seemed extraordinary.

Why did the originators of the musical papyri insist on a format so at odds with normative practice in the copying of literary texts? By way of reply, two suggestions. First, the mostly consistent format of the musical papyri coupled with their rareness implies a well-defined and strictly maintained tradition within a small circle—very different from, say, magical papyri, a specialized but more widely distributed use of writing where the variety of format is great. One cannot logically insist upon the connection, but the sense of a coterie brings to mind the music guilds (responsible, interestingly, for the Delphic inscriptions<sup>21</sup>), and it is perhaps not too great a leap to localize papyri like the Yale papyrus in a professional context.<sup>22</sup> Secondly, the formal insistence on exceptionally broad columns raises the question of functional advantage. I will simply assert what to me seems self-evident: that the sort of interaction with the music notation required if the papyrus were used as a musical script would be much facilitated by a longer line of notation. That is, a musician trying to read the musical text in order to perform the music might feel a strong need to scan ahead extensively, more so than a lector trying to read aloud the words of a sentence. That musicians were able to read these notes much in the manner of a modern musician reading staff notation should not be doubted: the Oslo fragment, in which many autograph corrections are written in a rapid script, proves that a composer could think in this notation in much the same way as Bach or Mozart; and several vases represent musicians singing or playing an instrument in front of a papyrus roll.<sup>23</sup>

Reflections on the format lead then to two primary conclusions, one practical, the other speculative: (1) it is likely that the Yale papyrus had quite a wide column, thus the parts of lines in lacuna may be substantial; (2) the format perhaps suggests that the Yale papyrus was owned by a professional musician, or by someone who adopted the accourrements of a professional, and that the owner may well have used the papyrus not just as an *aide-memoire*, but as a script from which to sing.

### §2.3 Contents and Style

The likelihood, as we have seen, is that even the first column of our fragment preserves no more than half of the original line length, and so our inability to pick up a continuous thread in the poetic content comes as no surprise. Nonetheless, enough remains that some progress can be made.

Column i. The speaker must be male, since the range extends to the low register of a baritone vocalist (§3.1). The consistency of syntax ('I will do A, B, C, D, E') and repeated mythological themes (Kastalian nymphs, Tempe (?), s/he who delights in the bow) seem to guarantee a single singer (and indeed one song). Several points strike one immediately. First, the repetition of first person futures is difficult to parallel, but has an urgent, emotional feel. The closest parallels one can cite are love epigrams where the lover proclaims what he will do for his beloved: AP 5.147 and 179 [Meleager], the first directed to the lover, the second to the god Eros. Secondly, there is the dramatic setting: an 'I' speaks to a 'you' (i.4, i.5), though whether a 'you'

<sup>19</sup> Winnington-Ingram (1955) 56-8.

<sup>&</sup>lt;sup>20</sup> The omission and subsequent addition of what appears to be a complete metrical colon at line 4 supports directly the conclusion that the scribe was copying from a colometrized exemplar (a suggestion I owe to M.L. West).

<sup>&</sup>lt;sup>21</sup> Paeans by Athenaeus and Limenius with musical notation were inscribed at Delphi by the Athenian Technitai on an external wall of the Athenian treasury; see #12 and #13 in West (1992a) 279–80.

<sup>22</sup> As we might surmise also from the notation itself. See above, n.8; on guilds, n.1.

<sup>&</sup>lt;sup>23</sup> Comotti (1991) 9 n.7, gathers examples (though he doubts whether these rolls are supposed to have musical notes written on them). See also West (1992a) 263 n.23, with references.

in the flesh, or a dramatic invocation of the 'you', is unclear. This leads to the third point, which is that whoever the 'you' is, the interaction is extravagant: something will be done with 'your feet' (unless 'your tripod'); presumably it is in relation to this 'you' that the speaker will take hold of a bow, taste, proclaim prophetically, fill an altar (with sacrifices?). The referent remains unclear, but on the face of it two broad possibilities suggest themselves:

- (1) The context is erotic, and the 'you' is the erotic object. This song is then a list of the extravagant things the lover will do for his beloved. One can imagine ways in which the elements of the list could be subordinated to this idea: the flowers in i.2 could be part of a lover's garland; the wilderness motif introduced in i.7–9 is reminiscent of e.g. the opening elegy in Propertius' collection (*Carm.* 1.1.9ff.); the bow in i.3, whether that of a hunter or of Eros, is a standard erotic motif; perhaps the lover claims that he will fill [Aphrodite's?] altar in celebration of the beloved at i.10; perhaps the 'prophecy' in i.6 is to proclaim the beloved a god or hero (see below). But other elements do not fit well with this hypothesis, especially lines i.4–5: why would a lover announce that he will sing of the Muses?
- (2) A second possibility is that the context is propitiatory or supplicant, and the 'you' is a god or hero. In this case, the song is a list of what the speaker will do to propitiate or celebrate the godhead; the flowers are offerings to the god, and the altar at the bottom of the column is likewise a natural reference; and the other items in the list would be things associated with the particular god or gods. Certain details (Muses, prophecy, 's/he who delights in the bow', 's/he who [slays/watches over?] the wild beasts') suggest Apollo and Artemis. Is someone addressing the children of Leto? Let us look at some specifics and see how the details add up.

ἴα, νάρκιστον i.2. Violets and narcissus, as spring wildflowers, are typical elements of the flowery meadow common as backdrop to erotic scenes. Some representative contexts: violets and narcissus are among the flowers Persephone gathers before the rape of Hades (*HH Dem.* 6–8; *cf.* Pausanias 9.31.9); these populate the meadow where Zeus spies Europa (Moschus 2.65–6); and these are standard denizens in meadows where lovers meet (e.g. Achilles Tatius 1.15.5, Longus 3.12.2, Virg. *Ecl.* 2.47–8); these colourful and fragrant flowers constitute garlands for a lover (*AP* 5.74 [Rufinus], 5.147 [Meleager]), are compared to various bodily parts of a lover (Achilles Tatius 1.19.1, 6.7.2), and in one poem make a suitable 'dress' for Aphrodite (Athenaeus *Deipn.* 15.30 [682]). But spring flowers can also be part of an offering to a god (*cf.* e.g. *AP* 10.7 [Archias], οὕτ' ἐπιδευῆ / εἴαρος ἀθρήσεις βωμὸν ἐμὸν στεφάνων), and one thinks in particular of the meadow-garland to Artemis that is the focus of the opening song of Euripides' *Hippolytus*.

κρατήςω τόξα i.3, τοξοχάρη i.7. To take up a bow suggests hunting or warfare, but τοξοχάρη, 's/he who delights in the bow', is clearly an epithet (and a new word: see commentary, §1.2). The bow in i.3 may then also be associated, however obliquely, with a hero or god. But which? Bows are especially attributes of (1) Eros of course, but also Aphrodite (cf. e.g. Anacr. 60.28); (2) Apollo; (3) Artemis. The latter two in particular favour epithets referencing the bow: τοξαλκέτης, τοξίας, τοξοβέλεμνος, τοξοδάμας, τοξοφόρος, arcipotens, arcitenens are all epithets of Apollo, many of which are used also for Artemis; τοξίτις, τοξόδαμνος, τοξότις are specific to Artemis; and cf. βελεσσιχαρής of Apollo at AP 9.525.3, and the ancient interpretation of ἰοχέαιρα (> ἰός + χαίρω), frequently of Artemis. But e.g. τοξαλκής appears as an epithet of Eros at Orph. Hymn 58.2; and there remain other possibilities, including Ares, Heracles, Atalanta, etc. Further below, at i.7 θηρο[.

]ποδων cῶν i.4. If ποδῶν cῶν, perhaps a suppliant context, as e.g. 'I will lay wreaths before your feet'; cf. Achaeus Trag. fr. 2 Snell, νῦν οὖν ἡμεῖς ἰκέται θαλλοὺς / στεφέων τε σέβας τίθεμεν πρὸ ποδῶν / τῶν cῶν . . . . The music favours a circumflex on the ultima, but still possible is τρι]πόδων, which calls to mind the Delphic oracle. Indeed Lucian (Hes. 8) lists the three essentials of the Delphic oracle as Κασταλία, δάφνη, τρίπους, all possible elements of this line (cf. Κασταλίδων, κλῶ[να δάφνης?).

Καcταλίδων i.4. The 'Kastalian nymphs', that is, the Muses, are closely associated with Apollo. ἄcω recalls the variety of proclamatory formulae that begin the *Homeric Hymns* ('I will sing of [god], I begin to sing of [god]', etc.), and it could be that in our song, as in *HH* 25, the singer proclaims that he 'will sing of the Muses and of Apollo'. Apollo is strongly linked with the Kastalian spring in both Greek and Latin poetry: thus, in another of the musical documents, Athenaeus, *Paean*, 5 (=*CA* p. 141); Bacchylides 3.20; Pindar, *Pyth.* 1.39, 4.163; *Paean* 6.5; Eur. *Ion* 94–5, *Ph.* 222–3; Nonnus 4.308 ff.; Aristonous, *Paean*, 42 (=*CA* p. 164); Horace, *Odes* 3.4 60–1, Propertius 3.3.13, Lucan 5.187–8, Sil. Ital. *Pun.* 14.468.

γεύσομαι i. 5. One might think to find in Greek erotic contexts, as in English, a common motif of lovers 'tasting of your delights' sim., but in fact usually the tasting is of death, blood, bitterness (bitter arrows, bitter honey), where not of wine. Yet often enough one tastes of springs or waters, which might provide a link back to the Muses in the previous line: AP 7.55.5–6, τοίην γὰρ καὶ γῆρυν ἀπέπνεεν ἐννέα Μουσέων / ὁ πρέσβυς καθαρῶν γευσάμενος λιβάδων; cf. Ovid, Am. 1.15.35–6. Tasting might also provide further suggestion of the Delphic oracle (and thus look forward to μαντεύσομαι in line 6), since among the Pythia's preliminary rites is sometimes said to be drinking from the Kassotis or Kastalia spring (Pausanias 10.24.7; Lucian Bis Acc. 1 cf. Hes. 8; Eusebius Pr.Ev. 2.3.2), or the ritual chewing of a bay leaf (Lucian Bis Acc. 1).

μαντεύcομαι i.6. Prophecy reminds us of Apollo, and cf. Pindar, Pyth. 4.163, μεμάντευμαι δ' ἐπὶ Κασταλία for the nexus prophecy–Kastalia–Apollo. Also possible is that the speaker will e.g. 'proclaim' someone (a love object?) a god: a much quoted epigram (to Lycurgus) runs δίζω, ἥ σε θεὸν μαντεύσομαι ἠέπερ ἄνδρα (AP 14.69.3).

θηρο[ i.7 and i.8. In i.8, it is surely the valley (τέμπεα or Τέμπεα) that receives the epithet: see the commentary (§1.2) for possibilities. But in i.7, the compound appears to refer to a hero or god. Artemis is the natural association. θηροκτόνος, θηροσκόπος, θηροφόνος all are used as epithets of Artemis, the last also of Apollo. The first is also used of Heracles, and θηρολέτης of the club of Heracles; θηρόβρομος of Hecate; etc. But a reference to Artemis seems almost inevitable here given the conjunction of τοξοχάρη and θηρο[ . Very likely, then, an address to the goddess in the vocative:  $\pi\alpha\rho\theta$ ]ένε τοξοχάρη θηρο[κτόνε sim. (Artemis/Diana can also appear in love poetry, usually as the extreme alternative for the lover plagued by Aphrodite/Venus: cf. e.g. Propertius 2.19.17–18, Tibullus 3.9.19–20.)

 $\pi\alpha\rho\theta$ έ[voc ii.3 Uncertain whether this line belongs to the same song, though that seems the more likely assumption (§3.0). The 'maiden' may bring Artemis once again to mind, but τὰς ἡδονὰ[c in the next line, albeit at a syntactical remove, does not encourage this line of speculation.

Some associations are ambivalent, but the number of strong links to Apollo and Artemis is striking. Most of the surviving details accord fairly well with the notion that someone, probably a mythological character, addresses the children of Leto, in celebration or supplication. Along the way, there are natural references to propitiatory offerings (i.2,10), to the Muses (i.4-5), to the Delphic oracle (i.5,6), and a direct address to Artemis herself (i.7,8). Given odd details like the holding of the bow and the proclamation of prophecy, this song cannot, I think, be a hymn (despite the formulaic 'I will sing of ...' in line 4), but there are not enough clues to define the context much further. The tone, however, seems exuberant, even brash: there is a decided lack of self-restraint in this voice which boasts to be able not only to sing of the Muses (a standard poetic claim), but also to proclaim prophecies, and which at the next moment appeals to Artemis directly. We must imagine, then, that the speaker thinks himself a favourite, whether a hero celebrating his actual power, or a hubristic fool destined for a downfall. In any case, I think on balance the first song is less likely to be a love song dotted with mythological motifs in the Propertian mode, and more likely a song in some sense directed at Apollo and Artemis, though the exact situation remains obscure. More definite conclusions: the song is clearly dramatic, in the sense that the singer conjures up a 'scene'; our fragmentary lines do not indicate more than one singer,

though one could suppose that the 'you' is on stage and sings in a part now lost; but I have already argued in the introduction that we should be careful in leaping from these dramatic indications to the assumption that the song represents a scene from drama *per se*.

The exuberant, indeed melodramatic, tone and manner of expression is enhanced by the poetic style, which is just short of bizarre. The poem displays a remarkable tendency to repetition and rhyme, observable even in these broken lines. Five first-person futures appear in the first column, an extraordinary circumstance considering that only twenty-odd words survive in this part of the text.<sup>24</sup> Given the fact that much of each line is in lacuna, these five futures were almost certainly joined by yet others. The recurrent futures give rise in consequence to an incantatory rhyming effect: -σω in i.3, i.4, i.10; -σομαι in i.5 and i.6. That the rhyme is deliberate is an easy inference from the last example, where the poet extends the rhyming syllables to three: γεύσομαι i.5, μαντεύσομαι i.6. In the relatively few words that remain of column one, yet more repetition is introduced:  $\sigma \hat{\omega} v$  recurs at i.4 and i.5; compounds beginning in  $\theta \eta \rho o$ - at i.7 and i.8; τόξα and a compound with τοξο- at i.3 and i.7. Repetition is familiar from other Greek (and Latin) poetry, and is sometimes said to be characteristic of Hellenistic poetry; but the dense repetition (of syntax, words, and word elements), and in particular the trisyllabic rhyme, is very unusual. The closest parallels I have been able to find are from oddball tidbits from antiquity, ditties in fact, such as songs for sailing, drinking and weddings; but even in these contexts trisyllabic rhyme does not occur.<sup>25</sup>

Column ii. Too little remains of the poetic text to merit discussion beyond what is set forth in the commentary (§1.2). Here too, though, the subject matter seems dramatic, extravagant, and probably mythological (whether or not our supposition of the tale of Procne and Philomela is correct). On the question of whether the top of the column belongs to the same song as column i, see immediately below.

# §3. MUSIC

Above the poetic text a second, non-professional hand (§2.1) has added vocal musical notation with diverse rhythmical sigla. The writer varies in his placement of the musical notes, sometimes positioning them over the vowel, sometimes (as e.g. i.6, ii.7) over the first letter of a given syllable.

We may assume, given the repeated first-person futures, that the first column comes from one song ('Song A'). The large marginal siglum at ii.5 marks a strong division (see commentary,  $\S1.2$ ), presumably to a new song ('Song B'). But whether the top of column ii continues Song A, or is the end of a different song cannot be determined. Since the music seems of a piece (for the insistence on 1 at ii.4 cf. i.2; for the rhythm at ii.4, cf. i.5.2–6, i.6.3–10), these lines are treated here as if they belong to Song A. But the reader should bear in mind how uncertain this assumption is. If we had to do with a normal literary piece, we would expect roughly 2–9 lines missing between the bottom of column i and the top of ii,  $^{26}$  only enough for a very short additional tune. But the format for the musical papyri is too idiosyncratic ( $\S2.2$ ) to warrant definite conclusions.

<sup>&</sup>lt;sup>24</sup> Runs of first-person futures are very rare. Beyond the examples given above from Meleager, I can list only two Roman-era examples, neither particularly helpful: a *cantus lugubris* where a mother speaking to her dead child lists the things she will do ('I will close the tomb, I will mourn, etc.': Heitsch (1961) 42); and a Christian hymn ('I will descend, I will reveal all the mysteries, etc.': Heitsch, 155).

 $<sup>^{25}</sup>$  For dense repetition and rhyme in songs for sailing cf. e.g. Heitsch (1961) 33; for drinking e.g. 39; for weddings e.g. 85 (where note esp. end rhyme in  $-\epsilon\sigma\theta\alpha$ i); but I find no examples of trisyllabic rhymes in collections of such songs. Nor are trisyllabic rhymes listed in the catalogue of rhyming figures by Guggenheimer (1972): see 128ff., esp. 132 for examples of rhyme among Greek and Latin poets. On repetition in earlier Greek poetry, see Fehling (1969), esp. 243–4, 248 for repetition of the elements of nominal compound; on repetition as characteristic of Theocritus, see Dover (1971) xlv–li; for repetition in Callimachus, Lapp (1965), esp. 54ff.; for repetition in Latin poetry, Wills (1996), esp. 418ff. But none of these studies, it should be emphasized, provides a clear parallel for what we see here.

#### §3.1 The Melodic Notation

Song A. The first song contains the following notes:

$$\star$$
 + 9 w 1  $\chi$  \$\phi\$ \$\tau\$ 
For the most part the identification of notes seems certain. The forms of  $\tau$ ,  $\tau$ , and 3, slightly unusual as letter shapes for this date, seem to be a normal way of writing musical notes:  $\tau$  is rare, but the hooked base is seen in *POslo* inv. 1413;  $\tau$  with a nearly vertical upright is found occasionally in the Oslo papyrus, and consistently in *POxy* 3704, 3705, 3161, 4461, 4463–5, and the Berlin Paean (*PBerol* inv. 6870); 3 in comparable form is found in *POxy* 3704, and cf the similar ductus in the Berlin Paean and *POxy* 3161, 4461, where, however, a final stroke usually pulls the tail to the right (and see further below). But the lowest four notes ( $\times + \circ$  w) are, if my interpretation is correct, remarkable—unexampled as notes in the other papyri and inscriptions, and musically unusual. These notes, which occur with but one exception only in line i.6, will require more extensive comment (below).

Taking for the moment only the notes frequently visited, we see that the melody tends to restrict itself to a very narrow compass. Most of the extant melodic phrases contain only the notes  $\tau \times \phi \subset 0$ , with occasional use of the chromatic  $\tau$ . These notes can be recognized as the central section (*Lichanos hypatôn* to *Mesê*) of the Ionian notation key in the diatonic genus.

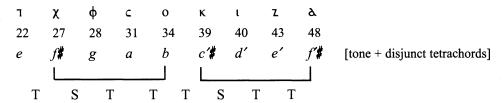
The opening lines (i.2–5) comprise these notes almost exclusively. In lines i.7–10 (again, skipping the problematic sequence in i.6), the notes i z become somewhat prominent, which together with 3 (twice in col. i, but see below) make up the next tetrachord in the Ionian conjunct scale (Mesê to Nêtê synêmmenôn). Excepting line i.6, then, the scale for column i comprises I plus two conjunct tetrachords, a perfect octave:<sup>28</sup>

<sup>&</sup>lt;sup>26</sup> Column height for literary rolls tends to the range 15-24.5 cm: see Johnson (1992) 180-6, 268-82.

<sup>&</sup>lt;sup>27</sup> Here and throughout I use the reference numbers associated by modern editors with the list of symbols in Aristides Quintilianus: see the tables of Barker (1989) 427–9; similarly West (1992a) 256. (Reference numbers in Pöhlmann (1970) 144 and Chailley (1979) 185 are off by three since the lowest three symbols are excluded.)

<sup>&</sup>lt;sup>28</sup> This series could also be the bottom of the Hyperionian scale (*proslambanomenos* to *mesê*). The modulation in column ii would then be κατὰ τόνον, which is less tidy theoretically—but this consideration comes into play only if that is in fact the same song.

But after the lacuna that intervenes between the bottom of column i and the top of column ii the composer modulates into a slightly different scale. We cannot be certain that this is the same song (§3.0). But if so, the composer has shifted to the Ionian disjunct scale. That is, the scale still begins at 7 and encompasses two tetrachords, but the two tetrachords no longer overlap:



This sort of modulation, natural for a composer used to thinking in tetrachords, seems to have been common in ancient music. Several sources mention the practice of modulation ( $\mu\epsilon\tau\alpha\betao\lambda\dot{\eta}$ ) 'by system' ( $\kappa\alpha\tau\dot{\alpha}$  σύστη $\mu\alpha$ ), by which is meant a shift from conjunct to disjunct tetrachords (in effect, from the Lesser to the Greater Perfect System, in the awkward terminology of ancient theorists). Aristides Quintilianus twice mentions a 'circular' movement up and down the scale whereby one ascends using conjunct tetrachords and descends using disjunct tetrachords—so natural did the modulation feel.<sup>29</sup>

So far, all is more or less as expected. The ambit of the melody is restricted to a single note over the octave, the melody line tends to prefer very small steps (with, however, more colourful phrasing at the end of i.4, the start of i.10, and the finale at ii.5), the modulation is of familiar type, from conjunct to disjunct tetrachords, and the melody is true to the selected notation key—the composer imports only  $\tau$ , borrowed from the chromatic genus, and that in the early lines where he is working sinuously within a very limited compass and feels the need for an additional semitone interval.

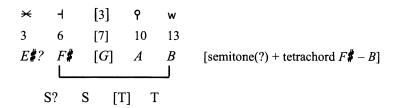
In this context, the musical sequence in i.6 is highly unexpected. First, some palaeographic observations. The ductus of  $\varphi$  seems deliberately to distinguish itself from  $\varphi$ : the writer writes  $\varphi$  without the evident ease with which he executes the familiar letter  $\varphi$  (and note the small round bowl, not the flattened oval of  $\varphi$ ; the hasta carefully penned from the top of that bowl, noticeably different from the long hasta of  $\varphi$ ). There can be little question that the writer is trying to signal a different note. That this note is, as it appears, koppa (#10) is confirmed by the context, for the notes that conclude the melodic sequence ( $\exists \times$ ) match notes nearby in the notation tables (#6, #3). These concluding notes are not in serious doubt:  $\exists tau$  rotated 90° to the right, a symbol which matches only #6 (vocal) or #21 (instrumental, thus very improbable); the left upper oblique of  $\times$  is rubbed away, but nonetheless the symbol can be only #3 (vocal). Taken together, the three notes  $\varphi \dashv \times$  form a tight sequence in the vocal notation. The composer is here, as so often in ancient music, working densely within a tight compass.

The other notes in line i.6 are more problematic. At first glance w seems likely *omega* (#25 = f), for the note approximates the letter form ( $\omega$ ) usual for this period.<sup>30</sup> But the ductus is noticeably angular in appearance, and the resulting musical interpretation is difficult. For not only is w = #25 = f exharmonic, but the sequence in line i.6 would then jump up and down the interval of a sixth four times, which in general terms seems uncharacteristic of ancient Greek

<sup>&</sup>lt;sup>29</sup> Aristides Quintilianus 1.9 (16), 1.12 (29); *cf.* Cleonides 15 Menge (205); Ptolemy *Harm.* 2.6. Barker (1989) 329 n.46, notes that Cleonides' separate classification of this type of modulation suggests its important role in ancient music. Other examples of modulation κατὰ σύστημα in surviving documents: Athenaeus, *Paean* (see analysis in Chailley (1979) 155ff.); *POxy* 3704 (see Haslam (1986) 46); *POxy* 3162 (Haslam (1976) 69).

<sup>&</sup>lt;sup>30</sup> Omega is unexampled as a musical note among the other papyri. M.W. Haslam remarks on a note resembling omega in POxy 3161 but favours a different interpretation: see Haslam (1976) 62.

music.<sup>31</sup> On the other hand, the angular appearance of w recalls #13 = B in the notation tables, and B is so superior musically—resulting in the usual tight interval of a single tone for the sinuous movement in line i.6, and a concluding drop of a fourth at the end of i.4—that it seems the necessary interpretation. Here, then, the composer has modulated to the lowest notes of the Ionian system, in theoretical terms the base of the Hypo-ionian notation key, where #6 is proslambanomenos, and #10, #13 the moveable notes of the first tetrachord; #3 is off the scale altogether. It is striking, though, that the low note plus tetrachord parallels the ambit we noted earlier for the principal notes in column i:



Two further problems remain, both intractable. The first is a matter of speculation. Given the framework of notes used elsewhere,  $\approx = E_{\bullet}^{\#}$  surprises, and one wonders if E (that is, a full tone lower than  $\dashv$ ) may be meant. The note  $\approx = \#3$  is not only unique here among ancient documents,  $^{32}$  but it is a mild surprise to find it at all: the lowest three notes are not part of any notation key, thus do not appear in the Alypian tables and are sometimes omitted in modern reference tables; notes #1-3 are known to us from the manuscripts of Aristides Quintilianus, but are 'generally supposed' (so Winnington-Ingram) to be late additions to the system. Inasmuch as symbol #3 is so rare, one wonders if there might not be confusion as to its significance. The composer in every other case ends the triseme sequence with e (and probably with f # - e: i.4, ef i.5, perhaps also ii.4), and the exharmonic movement down a semitone sounds rather odd—but nothing can be proven.  $^{34}$ 

The second problem regards a more central matter of interpretation. The symbol 3 will initially be read as ksi (#35, c'), despite the slight palaeographical oddity that the final stroke of the tail does not pull back to the right. 3 = #35 = c' is, as we have already seen, an expected part of the notes that form the frame for the melody in i.1-5 and i.7-10. So its appearance in i.4 (a movement of a third) is unremarkable. But if 3 is interpreted in this way the musical movement at i.6 is rather bizarre, a sudden leap of a third over an octave; while a different note of similar appearance in the Alypian tables, 3 = #7 = G, would fit in tightly with the sequence at i.6. But that latter interpretation would be then equally bizarre for the musical context of i.4. Since the same note seems intended in both places, I have thought it best to assume that the sudden shift to a much lower range is a dramatic flourish intended to accompany the word  $\mu\alpha\nu\tau\epsilon\dot{\nu}\sigma\sigma\mu\alpha\iota$ . But I am not sure.

<sup>&</sup>lt;sup>31</sup> Discussion of the general tendencies in West (1992a) 191–2. Among extant examples, *POxy* 3161 seems to contain repeated leaps of a sixth or seventh, but almost every case is doubtful, most very doubtful, as the editor (M.W. Haslam) notes *ad locc*. Similarly, in the Oslo papyrus, the well-preserved portions show almost uniformly small steps, whereas areas characterized by bold leaps are largely uncertain (though occasional sixths and sevenths are certainly present), as pointed out by the editor: Winnington-Ingram (1955) 51–2. Ancient music, like any music, does of course make use of larger intervals (*cf.* the apparent seventh at A.i.10 here), but these are usually reserved for the occasional dramatic effect. A sudden leap, or leap with return, is characteristic; repeated leaps of a sixth within a few notes is not.

<sup>&</sup>lt;sup>32</sup> The note is read with a question mark in *PLeid* inv. 510, 4.3 by its first editor, Jourdan-Hemmerdinger (1981); but Matthiesen (1981) states that the line contains no musical notation at all, and from the plate (see Matthiesen (1981) 24), the reading does seem very problematic. But I have not seen the papyrus (nor has Matthiesen, working from a slide).

<sup>&</sup>lt;sup>33</sup> Winnington-Ingram (1978). The lowest symbols (#1–3) are omitted outright by Pöhlmann (1970) 144, in his notation table, and given special status (#01, 02, 03 prior to #1, 2, 3) in Chailley (1979) 185, *cf.* p. 134.

 $<sup>^{34}</sup>$  M. L. West suggests (per litteras, 1998) that the lowest note may be  $E^{\sharp}$  and not E simply because the singer could not comfortably get down to the E.

In short, then, the first song works generally within a well-defined frame of notes in the Ionian notation key that modulates (unless col. ii is a second song) between conjunct and disjunct tetrachords. At line i.6, however, the word μαντεύσομαι is singled out for highly dramatic treatment, a shift to the low end of the singer's range. The shift down has a practical sideeffect for analysis, since it tells us that the singer is male, and, as written here, a baritone voice. But why this wild leap down the scale? The answer, I think, has to do with the drama, and with the dramatic presentation of the words. At exactly the point of this extraordinary plunge into the bass, the singer begins to mouth μαντεύσομαι. Now Apollo's priestess at Delphi is said by Plutarch (de def. orac. 438a) to have suffered a change of voice when the divine spirit enters her body, and voice changes are a common signal of spirit possession in many cultures.<sup>35</sup> Could it be, as M.L. West suggests, that 'some seers prophesy in a spiritlike basso profundo?'36 Typical Greek verbs for the Pythia's utterance suggest little more than shouting, but some support for a shift down to the bass can be found in the Aeneid, at the point when the Sibyl is possessed with the voice of Apollo—for Virgil chooses the verb *remugit* (6.99) to describe the sound she makes. The highly dramatic treatment of μαντεύσομαι may be taken, then, as a vivid example of what is meant by 'mimetic' music (for which [Aristotle], Problems XIX.15 is the locus classicus).

The melodramatic feeling of the bass plunge at i.6 is in keeping with the composer's style elsewhere. For not only are melisms generally frequent, but the composer apparently ends the song (ii.5) with an unparalleled flourish, a melism with fully nine notes to the syllable (ending, interestingly, with  $mes\hat{e}$ ).<sup>37</sup> Moreover, the range of the song is extraordinary: the other musical documents range from a span of a seventh to a twelfth,<sup>38</sup> but here the notation scale requires a range of over two octaves. Song A is then a composition written for a 'big' voice, one with wide range and able to drop suddenly to the deepest depths of the scale, and it contains a musical setting with plenty of scope for a highly dramatic presentation—details consistent with, indeed suggestive of, the scenario of a star performance (see introduction).

Song B. The second song is sparsely represented but so far as it goes contains the following notes:

٦	ф	0	ι	Z	δ	v	
22	28	34	40	43	48	49	[reference number]
e	g	b	d'	e'	f#	g'	[conventional modern equivalent]
4?/1?	1	1	1	2?/5?	6	6	[frequency count]

The interpretation of the shallow bowl of  $\circ$  as omega huption (#49) is consistent with the musical context: as often in ancient music, the composer repeatedly visits adjacent notes in a narrow compass. Exactly the same form of this symbol (with a musical context leading to the same

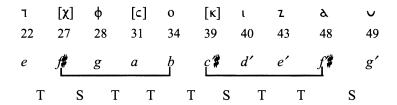
 $<sup>^{35}</sup>$  In general terms, possession by a spirit is marked by a change in the mode of speech, whether the obscuring of the content (from gibberish to hexameters) or the use of a different pitch of voice (usually very high or very low). See Maurizio (1995) 81–3 and the bibliography there cited. Most ancient depictions of spirit possession are unclear as regards the voice pitch. But when Cassandra is possessed by Apollo in the *Agamemnon*, Aeschylus imagines a high-pitched voice (cf. θροῶ, a woman's shriek, at 1137, 1140; comparison to a nightingale's cry at 1146; κλαγγὰ μελοτυπεῖς ὁμοῦ τ' ὀρθίοις ἐν νόμοις at 1152). On the other hand, the word Plutarch uses to describe the change of voice is τραχύς, which, interestingly, is also the usual term in Greek for a boy's voice, when it breaks (*LSJ* I.1 s.v.).

<sup>&</sup>lt;sup>36</sup> Per litteras (1998). Though this passage had early on reminded me of demonic possession as depicted in fiction like *The Exorcist*, I would never have considered the interpretation seriously had not Dr West brought to notice *Aeneid* 6.99 (on which see below).

<sup>&</sup>lt;sup>37</sup> West (1992a) 202 declares three notes the outside limit for what an ancient composer thought appropriate to a single syllable. West emended that statement in his edition of *POxy* 4466 (West (1998) 99), which exhibits a six-note melism. The nine-note melism here is therefore highly unusual, though it must be added that we have very few other witnesses to the end of a song. (That the song ends here is however not certain: see commentary §1.2.)

<sup>&</sup>lt;sup>38</sup> Details in West (1992a) 274–5.

interpretation) is found in POxy 3704; and in more fragmentary contexts in POxy 4462, 4466.<sup>39</sup> The notation key is the same as that of the close of the previous song, in formal terms the central section of the Ionian key in the diatonic genus, with the central tetrachords disjunct (*Lichanos hypatôn* to *Tritê hyperbolaiôn* in the Greater Perfect System, with  $\chi \in \kappa$  not represented in what remains):



The ambit is then one note to either side of the disjunct tetrachords. But in practice, the composer seems mostly to restrict himself to a much smaller range for a given part of the song, as we expect. In the first four lines, all but one note are within a fourth (d' to g'); by the last line (ii.10), the composer has shifted to a lower register, but here too keeps, it seems, within narrow compass (e to b, a fifth). Difficulty of interpretation arises, however, in line ii.9. At ii.6 and ii.8, the writer clearly notes z; equally clearly at i.7 7. But at ii.9 we find successive notes that are difficult to identify, resembling 7 but with a short tail at the bottom and a slight lean to the vertical stroke not seen in any of the several other examples of 7 in this text.<sup>40</sup> Does the writer intend z here? The musical context would certainly suggest it: if z, we find the usual tight interval (g' to e' to e' to f'); but if 1, two very wide leaps, both over an octave (g' to e to e'). Are the wide intervals part of the dramatic style, a grandly florid emphasis on the word ὄρνις? (If the same composer, cf. the treatment of μαντεύσομαι in Song A.) Or does the musical context so clearly demand 2 that the writer is content with careless notation? The latter seems the more sensible musical interpretation, but what then of line ii.7? Is this line another instance of the florid style, perhaps a dramatic shift upward of over an octave to heighten the shrill effect of κλαίει? In the transcription, I interpret 7 in ii.7, z in ii.9, but with more than the usual uncertainty.

#### §3.2 The Rhythmical Notation

The rhythmical relation of note to syllable is signalled by notations familiar from the other musical papyri. The Yale papyrus is unusually rich in these notations: particularly remarkable are the repeated use of triseme, the use of leimma, a means (apparently) for marking triplets, and the specific way that the writer deploys the stigme.

§3.2.1 Diseme and Triseme. From the Anonymus Bellermanni (§1, 83 Najock), we know that the diseme, a horizontal stroke over a note or notes, signals a double length; and the triseme, in form  $\vdash$  in the medieval tradition but  $\dashv$  in all ancient witnesses, signals a length of three time-units. Palaeographically, the triseme symbol here matches the instances in the Seikilos inscription, that is, with a straight arm at right ( $\dashv$ ) and not with the bent arm ( $\dashv$ ) of the instances doubtfully identified in other papyri.<sup>41</sup>

<sup>&</sup>lt;sup>39</sup> See remarks in Haslam (1986) 45. A siglum similar in form (and in a like musical context) also appears in a very fragmentary context at *PLeid* 510, line 8: see plate and disegno in Matthiesen (1981) 24. The letter shape seems in any case a natural formalization of the type of inverted *omega* found in e.g. the Michigan papyrus: cf. *PMich* inv. 2958, 20.5, 10.

 $<sup>^{40}</sup>$  The same problem of distinguishing among 7 z and 7 arises in P.Oxy. 44.3161 $\rightarrow$  1. 4, and 2.7. See comments in Haslam (1976) 59 ad loc. and 62. I do not here seriously consider the possibility of 7 = #19 = d since (1) the short tail, esp. in ii.9.2, suggests otherwise, and (2) the note would be musically incongruous.

<sup>&</sup>lt;sup>41</sup> As in the Oslo and Michigan papyri. See below, n.47.

Diseme is common in the musical documents, but its application in several papyri (such as *POslo* inv. 1413, *PMich* inv. 2958, *POxy* 2436, 3161, 3162) is disconcertingly unsystematic. The Yale papyrus is similarly confusing. The presence or absence of diseme where multiple notes reside over a syllable shows some consistency:

Multiple notes over long syllables

 $7 \times$  in A (i.3.3-4, 6.3-4, 6.5-7, 7.6-7, 8.6-7, 10.4-5, ii.4.4-5), none in B: the diseme is written above multiple notes over a long syllable; all are tied together with dicolon or hyphen. Similarly,  $3 \times$  in A a triseme is written above multiple notes over a long syllable.

 $4 \times$  in A (4.5-6, 4.7-9, 9.6-8, 10.1-3),  $3 \times$  in B (ii.7.2-3, 8.1-2, 9.4-5): multiple notes over a long syllable have no diseme or triseme; in every case introduced by dicolon (not hyphen).

That is, wherever the diseme is not written over a multiple note sequence, the notes are introduced by dicolon—an obvious difference in context the significance of which will be discussed below (§3.2.2). But the use of diseme over single notes seems irrational:<sup>42</sup>

Single notes over long syllables

 $8 \times$  in A (i.1.6, 3.5, 3.10, 4.9, 4.17, 5.2, 5.3, 9.5),  $3 \times$  in B (ii.7.1, 9.2, 9.3): the diseme is written above a single note over a long syllable.

 $10 \times$  in A (i.3.5?, 4.14, 5.7, 7.3?, 7.8, 8.3, 10.6, 10.9, ii.4.1, 4.2),  $4 \times$  in B (ii.6.1, 7.4, 8.5, 10.2; perhaps also 9.1): a single note over a long syllable has no diseme or triseme.

No contextual differences account for why the diseme is sometimes written over a long syllable and sometimes not. Two possibilities then: (1) Over a long syllable, a single note with diseme is twice as long as a single note without diseme. In our papyrus, one would assume therefore that lack of diseme shortens the metrically long syllable, since a double long would make triseme difficult to interpret. This strategy has, however, the disagreeable consequence that the musical rhythm has then little relation to the metrical rhythm.<sup>43</sup> (2) Over a long syllable, a note twice as long as a short syllable should always be read, regardless of the presence or absence of diseme, and the diseme is then written (or not) capriciously. This surprises, since we might reasonably expect the musical notation to be readable without attention to the metrical scheme of the poetic text. But that an ancient Greek vocalist easily sensed the length of a long syllable can hardly be doubted, even in the second century. As it happens, we can find fairly direct confirmation for the latter interpretation by study of short syllables.

Long notes over short syllables

2× in A, but both dubious. At A.i.4.2, a triseme seems to mark a short syllable, but more likely the triseme is meant to go with the following syllable. At A.i.9.3-4, it appears that two notes are set over the syllable which, if the word is correctly read, would be short. But in the absence of diseme there is no reason why the two notes may not be a half-beat apiece.

<sup>&</sup>lt;sup>42</sup> As also in the other papyri already mentioned: *cf.* remarks in Winnington-Ingram (1955) 40–1.

<sup>&</sup>lt;sup>43</sup> Though the musical rhythm overrides the metrical rhythm in the Berlin paean (a special case, however, since there all syllables are long), and to a lesser degree in the Oxyrhynchus Christian hymn (another special case, since it is necessary to accommodate to anapaests a fixed religious formula: *POxy* 1786, line 4). West (1992a) 130 aptly cites A. M. Dale: 'no poet would write words in elaborate metrical schemes merely to annihilate and overlay these by a different musical rhythm' (less compelling, however, if poet and composer are distinct). This degree of discrepancy is, we should note, quite different from allowing the music to introduce minor variations, such as the protraction of the long in the Seikilos inscription.

If long syllables could willy-nilly become 'short' by virtue of the musical context (thus breaking down the short-long opposition fundamental to the syllabic rhythm), one would expect analogous lengthening for short syllables—but nothing of the kind occurs. Only twice in our text might a short syllable be lengthened, but the first instance is both extraordinary (successive trisemes) and doubtful, the second instance uncompelling as evidence for lengthening the syllable. In the other musical documents, too, absence of diseme over a long is common, but diseme over a short syllable is extremely rare.<sup>44</sup>

On the other hand, there can be little question but that long syllables are not all simply twice the length of short syllables in the singing. The repeated use of triseme makes this clear. Here at any rate the composer allows prolongation of the long syllables, thus in some sense complicating the opposition of short and long—though how exactly the prolongation relates to the metrics of the text remains unclear. There are also a few spots where three notes are set to the same long syllable, and it is possible that these cases intend three times the basic time-unit (but this will not be the tentative conclusion reached here: §§3.2.2, 3.2.3).

Whether note sequences with diseme can also indicate rhythms beyond two χρόνοι πρῶτοι is more doubtful. Here as in other papyri the diseme seems often to be written more over one note than the other, such as co in A.i.3. In such cases editors have mostly followed Winnington-Ingram's lead in assuming that the placement of diseme is too casual for its position to be significant,<sup>45</sup> and thus that the diseme always regards the syllable and not the note. In the Yale papyrus, too, such an argument may hold for instances where diseme and hyphen are used together (the overbar at i.3.3 and 10.4 seems perhaps meant to intrude upon the following note, tied with the hyphen; the overbar at i.6.6 and ii.5.8 more certainly regards the three note sequence, all tied with hyphen), though the case is less strong where notes are introduced by dicolon (at i.6.4 the placement over the second note seems rather deliberate; less secure is the similar placement at 8.7). Note that in *POxy* 3162, our most carefully written musical papyrus, a two-note sequence introduced by dicolon has the diseme placed with precision above the second note (this papyrus contains no instances with hyphen).<sup>46</sup> This is suggestive, but the Yale papyrus does not show that same precision of placement. A comparison of disemes at A.i.6.4, 6.6, and ii.5.8 is instructive: at first, i.6.4 seems clearly to mean 'take diseme with the second note'. But at i.6.6 the placement of diseme is identical with the following three-note sequence, which, when compared with the similar sequence at ii.5.8, surely is meant to reference not the note but the syllable. I therefore transcribe diseme as regarding the syllable.

That the triseme, however, regards the note and not the syllable seems more secure. In all cases where triseme is used with a two-note sequence (A.i.4.4, 5.6, 6.10), the mark is placed with what appears great deliberateness over the second note of the sequence. What exactly this intends I am less sure. Logically, it should mean that the note with triseme has a value three times the value without, and thus that the sequence as a whole is the rhythmical equivalent of four time-units: \( \) \( \). But it is by no means improbable that the triseme intends instead to mark a second note longer than the first, to a total value of three time-units: \( \) \( \) \( \) . Under this second interpretation, analogous to our interpretation of diseme, the triseme in effect marks the syllable—though the position of the triseme makes clear which of the two notes is lengthened. Again, which interpretation is correct seems not strictly solvable in the absence of a clearer understanding of the underlying metrical rhythm. Moreover, other papyri provide but little help.

<sup>&</sup>lt;sup>44</sup> Diseme over a short syllable: only at *P.Oxy*. 2436 ii.5.6 and ii.5.12 (both uncertain, and the latter very doubtful: probably to be read with the following [long] syllable); *POxy*3704 fr. 1 $\rightarrow$  3 (very uncertain); *POxy* 3161 $\rightarrow$  1.8 (εμον, secure).

<sup>45</sup> Winnington-Ingram (1955) 35.

<sup>46 &#</sup>x27;... which shows clearly that the sign applies to the note as opposed to the syllable, and means presumably that [note 2] is to be twice the length of [note 1].' Haslam (1976) 71.

Triseme is a rare notation, occurring certainly only on the Seikilos inscription, in a couple of small fragments recently published in the Oxyrhynchus volumes, and possibly over a lone note in a scrap in the Vienna collection, so the comparative material is sparse.<sup>47</sup> But in the Seikilos inscription (where, however, the triseme is written over both notes) the iambic rhythm requires \( \) \( \) \( \) , and thus I transcribe here.

Triseme occurs in two contexts: the first (A.i.3.6) noting a rest of three time-units (if the interpretation here is correct: §3.2.3); the second (A.i.4.4, 5.6, 6.10) at word ends. These latter occur over two-note sequences in the only parts of Song A where the syllabic rhythm diverges significantly from dactylo-anapaestic patterns:

Given the new clause that follows immediately in i.4 ( $\alpha c \omega \delta \epsilon \kappa \tau \lambda$ ), one might also wonder whether this sequence marks the end of a colon. In the context, the triseme could, in effect, be making up the second short in a dactylo-anapaestic beat (that is, - substitutes for - ), but the arsis dots point rather to a more complex rhythm (§3.2.4). All this ignores, however, the significant problem of i.4.2, where before the triseme noted at i.4.4 (over the ultima of  $]\pi o\delta \omega v$ ), a second triseme is written. The placement of the note is ambiguous, but the rhythm is anomalous irrespective of whether the triseme is intended to lengthen the singing of  $\pi o$ - or yet further to lengthen the melism at  $-\delta \omega v$  (the latter perhaps more likely: see commentary, §1.1). In any event, this extraordinary double triseme will serve to warn us against too facile a solution of rhythmical questions on the basis of these uncertain and fragmentary remains.

In short then, diseme and triseme interlock as a system of rhythmical notation, which however admits of two interpretations. Under the first, both diseme and triseme regard note and not syllable. Thus  $\overline{\times}$  would mean  $\mathbb{R}$ ;  $\overline{\times} = \mathbb{R}$ ;  $\mathbb{R}$ ;  $\mathbb{R}$   $= \mathbb{R}$ ;  $\mathbb{R}$ ;  $\mathbb{R}$  (not extant) =  $\mathbb{R}$ . But for the reasons presented here—which, it should be emphasized, are suggestive rather than compelling—I have preferred a second interpretation, by which both diseme and triseme in effect regard the syllable, though triseme also indicates which note is lengthened. Thus  $\overline{\times}$ ,  $\overline{\times}$ , and  $\mathbb{R}$ ;  $\mathbb{R}$  all  $\mathbb{R}$ ;  $\mathbb{R}$  (not extant)  $\mathbb{R}$   $\mathbb{R}$ 

<sup>&</sup>lt;sup>47</sup> Trisemes in other texts: the Seikilos inscription, 6 *bis* (both over single note), 8 (over two notes, no hyphen), 9 (over two notes with hyphen), used at end of metron to fix the iambic rhythm; POxy 4464 lines 4 (over the first note of a pair, no hyphen), 6 (over a single note); POxy 4463, line 15 (over two notes with hyphen; from the plate perhaps not quite certain, inasmuch as the arm is indistinct, and the result uncomfortably similar to the diseme with dot at line 10); PVindob G 29.825c 2 (a tiny scrap, but over a single note; regarded as certain by the editors, though from the plate the remains appear too scanty to be unambiguous—remains of a diseme with very slight tick upwards at the end would yield the same result). Less certain: POslo inv. 1413, 2.b.9 (over two notes with hyphen), 16.9 (over two notes with hyphen), 17.2 (over a single note), 18.7 (over a single note), all doubtful but the latter three at the end of an iambic trimeter (Pearl and Winnington-Ingram (1965) 191; Pöhlmann (1970) 125); PMich 2958, all doubtful (for the possibilities and their merits, see Pearl and Winnington-Ingram (1965) 191–2; Pöhlmann (1970) 138–9); POxy 3161  $\rightarrow$  4.3, only 'possible' (Haslam (1976) ad loc.); West (1992a) 266 n.29 notes, 'one of the unpublished Hellenistic fragments appears to have the form  $\sim$  'but reports per litteras that this reading is now to be abandoned. Finally, Matthiesen (1981) 28 thinks to find a triseme at PLeid 510, line 10 in 'a form not recorded in the treatises' (3 vertical lines), but this seems no more likely than the pentaseme he records at line 12 of the same (very mutilated and uncertain) text.

<sup>48</sup> See now POxy 4464 line 4, where an example of  $\times \times$  is clearly evident. The sequence is interpreted without discussion by the editor as  $\searrow$ : West (1998) p. 95. If the interpretation here is correct, that will need adjustment.

80

§3.2.2 Dicolon and Hyphen. The discussion so far has assumed that dicolon and hyphen are written in the usual way, to separate and group. A further, more hesitant assumption has been introduced that the notation group and the syllable match in length, except where triseme marks a prolongation. The question now arises as to how these symbols may differ from one another.

Both dicolon and hyphen define a group: dicolon by segregating what follows from what precedes, hyphen by tying elements together directly. In many cases the two seem to operate as alternatives without obvious distinction. A clear instance of this can be seen in lines 5–6 of the first column. In successive lines, the composer introduces phrases which are markedly parallel: verbs in the same tense and person that rhyme over three syllables; metrically the same shape; in each case a melism over a final syllable marked with triseme.

In such a case, a functional equivalence seems very probable; and dicolon is then written in the one line, hyphen in the other *ad libitum*. (Of course a more subtle difference may be intended, such as in the phrasing, but in the absence of ancient testimony this is irrecoverable.) Similarly, there is no obvious functional difference between a case like  $\overline{\varsigma o}$  in i.3 and  $\varepsilon \circ s \circ s$  in i.7, and other papyri confirm our inability to find a general rule for writing the one as opposed to the other. With that said, there are, however, some ways in which dicolon and hyphen seem to distinguish themselves.

We noted earlier (§3.2.1) that diseme always accompanies a multiple note sequence written over a long syllable and joined by hyphen ( $\overline{xx}$ ), but that diseme is usually omitted in the same cases where the group is introduced by dicolon ( $: \overline{\times} \times$  occurs, but only once, whereas  $: \times \times$  occurs 7x). The difference may be due to a capricious habit of the writer (there are too many examples to be coincidence), but if significant, it seems to imply that in the absence of triseme the dicolon unambiguously fixes the length of what follows, presumably to the length of the associated syllable. This hypothesis accords neatly with the fact that, although the dicolon is often used where hyphen might also be used, dicolon is the usual choice where the value of the notes might otherwise be ambiguous. Thus where a melism occurs over a short syllable, dicolon is generally employed: so here at i.9; and also in  $POxy 3704 \rightarrow (1.6)$ ,  $POxy 3161 \rightarrow (2.4, 4.4)$ , POxy 1786(lines 3, 4), POxy 4466 (line 4), probably POslo 1413 (4.8–9, 14.12–13), and once in PMich 2958 (line 30), which however also joins *POxy* 4463 (line 8, bis) in using hyphen instead for this case.<sup>49</sup> The distinction proposed above also would allow for more complex groupings to be unambiguously represented: thus, regardless of how meticulously diseme is (or is not) written,  $: \overline{\times \times \times}$  can be used to indicate  $\bigwedge$  (as at *PBerol* 6870, lines 3, 8, 10; probably *POslo* 1413, line 18; several times in POxy 1786; PMich 2958 alone omits dicolon in such cases). In the Yale papyrus, too, dicolon is combined with hyphen and diseme, but the hyphen is written under all three notes, which by the analysis followed here is then clearly a triplet, a very rare notation:<sup>50</sup> A.i.6 : <del>Qw9</del>, ii.5 : <del>Qz9</del>.

<sup>&</sup>lt;sup>49</sup> See Pearl and Winnington-Ingram (1965) 189.

<sup>&</sup>lt;sup>50</sup> Triplets are otherwise known only in the extraordinary melism at POxy 4466, line 2, and in the Berlin Paean (and there but doubtfully): PBerol inv. 6870, lines 4 (over ultima of  $\pi\alpha\gamma\alpha$ i), 7 ( $\pi\nu\rho$ -), on which see Winnington-Ingram (1955) 76, and Pighi (1943) 188; but neither reading is accepted in the re-editing by Pöhlmann (1970) 94. Very dubious are the readings of a triplet at POxy 2436 ii.4.8–10 (Turner and Winnington-Ingram (1959) 117) and PMich 20.12–14 (Pearl and Winnington-Ingram (1965) 189), where the hyphen seems to cover only the last two notes of a three-note group. Triplets may also be meant at POxy 4463, lines 4,7,13, interpreted however by the editor as

§3.2.3 Leimma ('rest'; or prolongation). The rounded form of leimma (n, as also in PBerol 6870, PMich 2958, POxy 1786, 3704, 4463, 4467) occurs four times, all in Song A, and in two different contexts. In the first (A.i.3.6), a long syllable at word end has above it a note with diseme; the leimma, with triseme, follows that. Note and leimma are written closely together (as space necessitates), but no hyphen or dicolon groups the two notes together. Since the leimma occurs at word end and without a tie to the preceding note, I take the symbol here to indicate rest rather than prolongation. In the other context, however, prolongation is clearly intended. In these three cases (A.i.4.9, 9.8, 10.3) the leimma occurs as the final notation in a three-note sequence introduced by dicolon and residing over a long syllable. All three occur in mid-word, a circumstance which argues strongly against a rest (pace Haslam's interpretation at POxy  $3161 \rightarrow 1.10$ ). Not clear, however, is whether  $\Lambda$  or  $\Lambda$  (that is,  $\Lambda$ ) is intended. The only exact parallel is PMich 2958 line 1, where the partial line and iambic rhythm admit either interpretation. The question arises once again to what degree the metrical rhythm can be refashioned by the musical rhythm. Do we assume here that the trio of notes must add up to a single 'long', and that protraction of the second note implies a necessary shortening of the first note? Or does the use of three notes imply three 'short' units, thus adjusting the 'long' to one and a half its usual length? In keeping with our analysis of dicolon, the former interpretation is adopted here. That then has the happy consequence that the leimma acquires a unique function, one distinct from diseme or triseme, which in turn helps to validate our interpretation of the system as a whole. It has been doubted whether triseme and leimma as prolongation can occur in the same manuscript<sup>51</sup>—but that follows only if we assume that both  $\times \times$  and  $\times \times \cap$  mean  $\downarrow \searrow \downarrow$ . That  $\times \times \cap$  (without dicolon) can sometimes mean \( \int \) seems guaranteed by \( POxy \) 2436.52 But in the Yale papyrus, where both triseme and leimma are clearly evident, a different system must come into play. Here leimma is unlikely to mean  $\downarrow \downarrow \downarrow$ , since, however we interpret diseme and triseme (§3.2.1), there is already a way to represent this rhythmic combination. That  $:\times \times \cap$  means  $\mathbb{A}$ (or )) seems then an unforced conclusion, regardless of the importance one attaches to our (admittedly provisional) interpretation of dicolon.

The leimma in every case carries the stigme (arsis-dot). The dotting of leimma seems conventional—a natural consequence of the fact that, regardless of whether leimma marks protraction or rest, it cannot be the downbeat. In the musical papyri generally, either every leimma carries the stigme (including cases where the leimma comes in the midst of a melism, cf. *PBerol* 6870 lines 4, 7, 8, 10) or none of the leimmata carries the stigme—the only exception being *POxy* 3161.<sup>53</sup>

Twice (A.i.3.6, 9.8) the leimma is palaeographically close to pi, a possible if exharmonic musical note, but (1) all four leimmata occur in the unusual contexts described above, an extraordinary coincidence if some or all were simply another musical note; (2) the squared shape may at first seem odd, but the notation form is readily paralleled in POxy 1786 (and is natural enough once the siglum is no longer strongly associated with  $\Lambda$ ).

§3.2.4 Stigme ('arsis-dot'). Stigme, a single point, is written indifferently above or to the right of the musical note (and above the diseme or triseme) as spacing demands. These dots are said by the Anonymus Bellermanni (§3 Najock) to mark the arsis (upbeat), but papyrological remains

(West (1998) 92–3). If dicolon means 'take the following group as equal to the underlying length of the syllable', that would help also to explain its odd use in the melism at *POxy* 4466, line 2, where the triplets might then better be taken as eighth notes, , and similarly at *POxy* 4465, line 5.

<sup>&</sup>lt;sup>51</sup> Pearl and Winnington-Ingram (1965) 191; Pöhlmann (1970) 138.

<sup>&</sup>lt;sup>52</sup> See Turner and Winnington-Ingram (1959).

<sup>&</sup>lt;sup>53</sup> Leimma with stigme in *PBerol* 6870, *PMich* 2958, *POxy* 3704, 1786, 4463. Leimma without stigme in *POslo* 1413, *POxy* 2436, 4461.

of actual notation have often frustrated modern editors.<sup>54</sup> It is sometimes supposed that the problem is one of transmission or a copyist's negligence, but if the hypothesis is correct that the musical notation is often (though not always) written by a professional musician and with a view to performance (§2.2), then necessarily the dots are not incidental but are intended to guide the musician in the reading of the music. Where no system can be discerned, it seems more reasonable to look, not to scribal error, but for problems in interpretation. Fundamental in this regard is not only our incomplete understanding of the rhythmical nature of the music, including its relation to the metre, but also our uncertainty as to whether the presence or absence of a dot is in fact intended and not the result of papyrus damage. These considerations conspire with the partial lines to make analysis more than usually doubtful.

With that said, stigmai on the Yale papyrus are suggestive in some interesting ways. At several points in the dactylo-anapaestic rhythm, an apparently dactylic sequence is marked not with dots on the arsis or thesis of the dactyl, but on the dactyl as a whole. Some runs where the reading is fairly certain for both the presence and absence of the stigmai:

Song A	i.3	το-ξα-τα	(dactyl unmarked)	
	i.4	δε τα κα-ετα-λι-δων	(central dactyl marked)	
	i.5	το-ξο-χά-ρη	(dactyl marked)	
	i.8	τέμ-πέ-ά θη-ρο[	(dactyl marked)	
	i.10	βω-μο-ν ε-γώ	(leading dactyl unmarked)	
Song B	ii.6	μου-ει-κα	(dactyl unmarked)	
	ii.8	μυ-ρο-με-νη	(leading dactyl unmarked)	

This pattern seems to suggest, somewhat surprisingly, that we are dealing with runs of dactyls grouped rhythmically in pairs on the analogy of an anapaestic dipody. The situation is not, however, quite so simple as that. In two places, a dactylic rhythm dominates, but the dactyls are not marked as such:

i.4 
$$\alpha - \epsilon \dot{\omega} [\delta] \epsilon \tau \alpha$$
 (long marked, shorts not)  
i.9  $\pi \epsilon - \lambda \dot{\alpha} - \gamma \omega \epsilon$  (first short unmarked, the second marked)

In the second case the reading of the first syllable is not entirely certain (the dot may have rubbed away, though I think not), and the first case is in a confusing area of the papyrus where the line is corrected by the second hand; but these examples should nonetheless caution that much remains obscure.

At a few points in the papyrus, a different rhythm predominates, as we have seen. In these cases, we find the stigme written or omitted over elements in the form of iambic or trochaic feet  $(\lor - \text{ or } - \lor \text{ or } - \lor \text{ or } - \lor)$ . Cases where the disposition of stigmai is clear:

<sup>&</sup>lt;sup>54</sup> PBerol 6870, Ajax fragment (see Winnington-Ingram (1955) 80); PMich inv. 2958 (see Pearl and Winnington-Ingram (1965) 186 and 191–2), POxy 3704, 3161; and there are often many exceptions in the papyri where stigmai seem more rational, as e.g. in POxy 2436.

In all these cases, stigme marks iamb or triseme, while the unmarked segment (in thesis) is trochaic. Given the fragmentary lines, full rhythmical analysis remains impossible (§3.3), but what seems clear enough is that in the earlier cases the rhythm is informed by units of  $- \circ \circ$ , whereas in the latter cases the rhythm is based instead on units of  $- \circ \circ$  (or triseme). The fact that the writer marks both  $- \circ \circ$  and  $- \circ \circ$  further suggests, perhaps, the analysis of a complex or 'inverted' metron (such as a dochmiac or choriamb or epitrite).

#### §3.3. Metre and Accent

The partial lines frustrate full analysis of the metrical shape of the poetic texts. That both songs are largely dactylo-anapaestic is obvious, but little else is certain. The way in which stigme is deployed would seem to imply dactyls rather than anapaests, though this remains a tenuous conclusion (§3.2.4). In Song A, where we have more to work with, other rhythms seem to be introduced, but all involve the use of triseme, complicating the interpretation. Sequences such as  $- \circ \circ - - \circ \ldots$  (i.7; cf. i.2, i.9) preclude in any case a simple dactylic metron, however the triseme sequences are resolved. The triseme sequences themselves are, as we have seen (§3.2.1), tantalizing but finally inconclusive. It is not even certain that the rhythm of the triseme is meant to resolve the poetic metre. The sequence

recurs at i.5, i.6 (and cf. i.4, ii.4), which without regard to triseme suggests dactylo-epitrite in a form like (-) D - e (-) ||. If correct, the conclusion is significant, since dactylo-epitrite seems to have fallen out of favour in the second or first centuries BC,<sup>55</sup> and the likelihood would be, then, that we have here a poetic text from the Hellenistic era. But the conclusion remains only probable: if we locate period end after the triseme, an alternative analysis might be, for instance, a periodic introduction of dochmiacs (for which cf. the Grenfell fragment, CA 177).

We can be more positive about the significance of word accents. In the musical documents, non-strophic compositions tend to general but not absolute agreement between word accent and melody (as first remarked by Crusius over a century ago).<sup>56</sup> The Yale papyrus is no exception. Accommodation to the general rule that 'the accented syllable is given a note at least as high as any other in the same word' is fairly consistent. This holds true for words with acute accent 9× (Song A: νάρκισσον, i.2, κρατήσω i.3, γεύσομαι i.5, μαντεύσομαι i.6, τέμπεα i.8, πελάγους or λαγούς i.9; Song B: κλαίει ii.7, μυρομένη ii.8, ὄρνις ii.9), with circumflex  $2 \times (\sigma \hat{\omega} v i.4, \mu \hat{\omega} \lambda - i.4)$ λον i.9), with grave  $4 \times (\beta \omega \mu \dot{o} v)$  i.10, ήδονας ii.4, μουσικά ii.6, γυνή ii.10). Against this are only three exceptions:  $\mathring{\alpha}$ σω at i.4 (if the interpretation of 3=#35=c' is correct), Κασταλίδων i.4, πλήσω i.10 (and perhaps also τοξοχάρη i.7). The rule that these accents are 'set at the summit of a rising and falling figure' in the melody also generally holds: this is true even for πλήσω at i.10, and beside Κασταλίδων i.4 are only two exceptions (γεύσομαι i.5, ὄρνις ii.9). But more subtle rules inferred from the musical documents with less authority (since the rules hold less consistently) are not well exemplified in our papyrus, though the evidence is meagre. The rule that a syllable with circumflex is 'often set on two notes of which the first is higher' is violated by the two surviving examples in our papyrus ( $\hat{\sigma}$  i.4,  $\hat{\mu}$   $\hat{\alpha}$   $\lambda \lambda \hat{\nu}$  i.9), both of which have a rising

<sup>&</sup>lt;sup>55</sup> See the account in West (1982) 139–41: on the thin evidence we have, dactylo-epitrite, which was 'in the fourth and third centuries [BC] the normal metre for what may be called educated bourgeois lyric', fell out of fashion shortly thereafter.

<sup>&</sup>lt;sup>56</sup> See discussion and bibliography in West (1992a) 198–200. In what follows, I use West's formulation of the general rules (p. 199). The rules are drawn primarily from the practice of the Delphic hymns: see Winnington-Ingram (1955) 64–7.

pair of notes (but cf. possible  $\pi o \delta \hat{\omega} v$  i.4, with a falling pair). The rule that 'when the accent falls on the final syllable of a word, and is not circumflex, and not succeeded by a grammatical pause, then the melody does not fall again until after the next accent' receives mixed treatment: followed at i.4 and ii.4, violated at i.3 and i.10 (unless a grammatical pause after  $\beta \omega \dot{\omega} v$ ?). The inattention to these lesser rules, particularly the last, accords with the practice observed in other members of the group we isolated at the start (POxy 2436, the Oslo papyrus, the Berlin Paean, the Michigan papyrus),<sup>57</sup> a natural result perhaps of the weakening intonation of the accent in later Greek. Like so many other characteristics of the Yale papyrus, then, this may represent not simply the habit in a single papyrus, but a general feature of musical texts from the early empire.<sup>58</sup>

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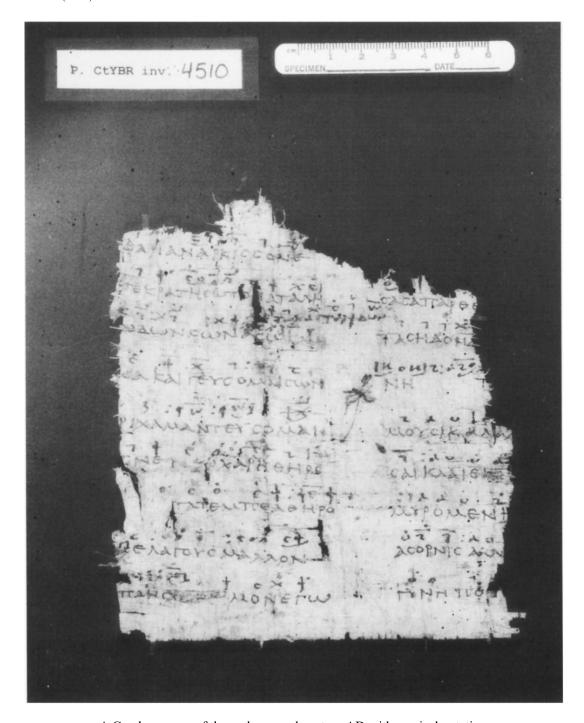
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<sup>57</sup> Winnington-Ingram (1955) 69-73; Pearl and Winnington-Ingram (1965) 187-8.

<sup>&</sup>lt;sup>58</sup> I here record my deep gratitude for helpful comments and advice from R.G. Babcock, M.L. West, M.W. Haslam, B.P. Johnson; and for the Beinecke Library's award of a John D. and Rose H. Jackson Visiting Fellowship in support of this study.

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A Greek papyrus of the early second century AD with musical notation:

PCtYBR inv. 4510 (13.0 x 14.2 cm).

Photograph by courtesy of the Beinecke Library,
Yale University, taken under infrared light.



 $\label{eq:new Fragments} New\ Fragments\ of\ Ancient\ Greek\ Music$ 

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traditional ones of 20th-century music and sociology. Judging from graduate students currently working on degrees, however, such lacunae will disappear provided that these men and women find appropriate positions within the Canadian establishment. And the recognition by this establishment of the work done by musicologists depends on our cultivating the attitudes advocated at the start of this report. Then can Canadian scholars of music realize a unique opportunity of forging an organization that fosters all branches of research in such a way as to give each one equal status as a member of the humanities. This kind of cooperation will end the fragmentation and isolation evident on the national level, and it will furthermore add national prestige to deserving work already appreciated as such in the United States and in international circles.

# New Fragments of Ancient Greek Music\*

THOMAS J. MATHIESEN (PROVO/UTAH)

Scholars interested in the music of classical antiquity have long hoped that someday, somewhere, the music for a complete tragedy or some other major poetic work would be discovered. In fact, in the past few years, six new fragments of ancient Greek music and some additional exemplars of pieces already known have been discovered. While these discoveries do not fulfill that elusive wish, they are discoveries of considerable moment. This is so not simply because they enlarge the corpus of extant pieces, but rather because all these fragments provide evidence for points of theory discussed in the Greek musical treatises. Moreover, one of the fragments is of singular importance because (1) it appears to be the oldest fragment yet discovered, (2) it is a fragment from a late tragedy of Euripides, a composer well known for his progressive or—as some of the observers of his day thought—decadent settings, and (3), as a second example of a Euripides setting,<sup>2</sup> it provides the opportunity for comparisons illuminating the nature of ancient Greek music and of this composer's music in particular.

<sup>\*</sup> This report was originally presented in a somewhat different form at the Forty-Fifth Annual Meeting of the American Musicological Society in New York in 1979. I wish to express my appreciation to the American Council of Learned Societies for a Grant-in-Aid, which has enabled me to acquire microfilms of many of the Greek codices musici; to the Institute for Ancient Studies of Brigham Young University for obtaining slides of the Oxyrhynchus papyri 3161 and 3162; and to Dr. E. Boswinkel of the Papyrological Institute of the Rijksuniversiteit in Leiden, who kindly supplied me with color slides of Inv. 510, all of which were used in the preparation of this report. I am also grateful to the Egypt Exploration Society for permission to reproduce plates of the Oxyrhynchus papyri and to the Papyrological Institute of the Rijksuniversiteit in Leiden for permission to reproduce a plate of Inv. 510.

<sup>&</sup>lt;sup>1</sup> The late Gustave Reese captured the sense of this desire in his inaugural lecture for the Ph.D. program in music at the CUNY: "How maddening it is that, of all the music that was once sung and played in connection with the plays of Aeschylus, Sophocles, Euripides, and Aristophanes, only a tiny fragment of music for the Orestes of Euripides has been found. Of course, we must be resigned to the fact that this gap may never be narrowed, no matter how hard scholars may exert themselves. But scraps of ancient Greek music do continue to be found from time to time, and we may hope that the end has not yet been reached" (Perspectives and Lacunae in Musicological Research, in: Perspectives in Musicology, ed. Barry S. Brook et al. [New York 1972], p. 6–7).

These fragments have so far been virtually ignored by musical scholars and have received only scant notice among classicists. This report will introduce the new fragments and exemplars, with a particular focus upon the new Euripides fragment and will also suggest that although we do not possess that longed-for complete tragic setting, we do have a considerable amount of ancient Greek music, more than enough, in fact, to support convincing and enlightening analysis.

First of all, let us begin with a listing of the new materials.

## Papyrus

fragments 1-4: Oxyrhynchus Papyrus 3161. Texts with Musical Notation.

27 3B41D(4-6)a+27 3B42E(3-4)a

Fr. 1: 5.7 x 14.5 cm

Four fragments dating from the third century A.D.

The back of fragments 1 and 3 also contains text and notation.

fragment 5: Oxyrhynchus Papyrus 3162. Text with Musical Notation.

10 1B.161/G(g)

7 x 7.5 cm

One fragment dating from the third century A.D.3

fragment 6: Leiden Inv. 510. Euripides Iphigenia Aulidensis 1500-1509(?), 783-93.

6 x 7.5 cm

One fragment dating somewhat earlier than 250 B.C.4

# Manuscript

Hymns of Mesomedes<sup>5</sup>

Berlin, Deutsche Staatsbibliothek

Berolinensis Phillippicus gr. 1555, f. 72r-v

Hamburg, Staats- und Universitätsbibliothek

Hamburgensis cod. phil. 110 [Berlin], f. 10v

Munich, Bayerische Staatsbibliothek

Monacensis gr. 215, f. 457r-v

Modena, Biblioteca Estense

Mutinensis gr. 173 ( $\alpha$ .V.7.1), ff. 110r–111v

Naples, Biblioteca Nazionale

Neapolitanus gr. 259 (III.C.1), ff. 218v-219r

Paris, Bibliothèque Nationale

Parisinus gr. 2458, ff. 82r-v

Parisinus gr. 2532, ff. 98r-99r

<sup>&</sup>lt;sup>2</sup> The famous *Orestes* papyrus (*P.Wien* G 2315) is the other. The question of whether the music itself is Euripides' cannot be answered. In style, it would seem to fit contemporary accounts of Euripides' music, and since there is no evidence to suggest that tragedies were ever set by anyone but the poet, there seems to be no special reason to suppose the music is not, in general, a copy of Euripides' music. The *Orestes* papyrus has been the subject of a great many studies, some of which are summarized in the now standard edition: EGERT PÖHLMANN, *Denkmäler altgriechischer Musik*, Erlanger Beiträge zur Sprach- und Kunstwissenschaft 31 (Nürnberg 1970), p. 78–82. See also two recent and important studies of the papyrus: GIOVANNI MARZI, *Il papiro musicale dell' 'Oreste' di Euripide*, in: *Scritti in onore di Luigi Ronga* (Milano 1973), p. 315–29; and JON SOLOMON, *Orestes* 344–45: Colometry and Music, in: *Greek*, Roman, and Byzantine Studies 18 (1977), p. 71–83.

<sup>&</sup>lt;sup>3</sup> Fragments 1-5 are located at the Ashmolean Museum, Oxford University.

<sup>&</sup>lt;sup>4</sup> Fragment 6 is located at the Papyrological Institute, Rijksuniversiteit, Leiden.

<sup>&</sup>lt;sup>5</sup> The list includes only those exemplars omitted in PÖHLMANN, Denkmäler, p. 13–31. Some of these exemplars are noted in KARL VON JAN, Musici scriptores graeci (Leipzig 1895), p. xi–xciii; and IDEM, Musici scriptores graeci, supplementum (Leipzig 1899), p. 40–59, but they are not subject to collation and have dropped out of sight in Pöhlmann's edition.

Salamanca, Biblioteca de la Universidad Salamantinensis Universitatis 2748 olim Matritensis Bibliothecae Regiae 38, ff. 134v-136v Rome, Biblioteca Apostolica Vaticana Vaticanus gr. 1364, ff. 145v-147r

Koine Hormasia<sup>6</sup>
Bologna, Biblioteca Universitaria
Bononiensis gr. 2432, f. 42r-v
Cambridge, University Library
Cantabrigiensis Universitatis gr. 1464 (Gg.II.34), f. 14r
Florence, Biblioteca Medicea-Laurenziana
Florentinus Laurentianus Acquisti e Doni gr. 64, f. 7r-v
Florence, Biblioteca Riccardiana
Florentinus Riccardianus gr. 41 (K.II.2), f. 61v

The first four fragments to be considered, Oxyrhynchus Papyrus (*P.Oxy.*) 3161, were published in 1976 with transcription and critical notes by M. W. Haslam.<sup>7</sup> Haslam's treatment is quite detailed, though there are a number of his points that may profitably be reconsidered. Since it is beyond the scope of a single report to examine each fragment in detail, I shall instead concentrate on a number of Haslam's observations that will be pertinent to the ensuing discussion of the Leiden Euripides fragment.

The first fragment of P.Oxy. 3161 is exhibited in Figure 1 (v. p. 17).

In his discussion of the melody, Haslam observes that it has "appreciable but not absolute regard for word-accent." In fact, while it is true that some of the syllables with acute accents have higher notes than syllables without, it is clear from the contour of the musical lines that there is almost total disregard for the so-called rule of accent and pitch:

- 1. Syllables in polysyllabic words with an acute, grave, or circumflex accent have a pitch higher or at least not lower than unaccented syllables in the same words.
- 2. Grave syllables do not have a pitch higher than the accented syllable of the following word.
- 3. Melismas and circumflexed syllables descend.9

<sup>&</sup>lt;sup>6</sup> The list includes only those exemplars omitted in PÖHLMANN, *Denkmäler*, p. 32–35. Jan includes all these manuscripts in his list; he does not note the presence of the Koine Hormasia in any of them, however, and in the case of Bononiensis gr. 2432, incorrectly asserts (p. xci) that the Koine Hormasia is not present.

<sup>7</sup> M. W. HASLAM, *Texts with Musical Notation*, in: *Oxyrhynchus Papyri* 44 (1976), p. 58–72, plates VI-VII.

<sup>&</sup>lt;sup>7</sup> M. W. HASLAM, Texts with Musical Notation, in: Oxyrhynchus Papyri 44 (1976), p. 58–72, plates VI-VII. My study of the Oxyrhynchus papyri is based on a fresh examination of the fragments in the form of color slides.

<sup>8</sup> HASLAM, Texts, p. 63.

<sup>9</sup> PÖHLMANN, Denkmäler, p. 140.

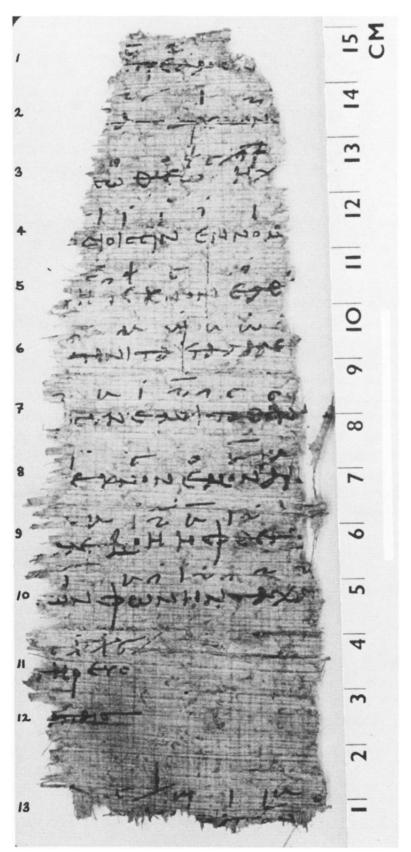


Figure 1. Oxyrhynchus Papyrus 3161, fragment 1, face Reproduced by permission of the Egypt Exploration Society, London

For example, a transcription of lines 5–9 of fragment 1 would exhibit the contour shown in Example 1.10



Example 1. Transcription of lines 5-9, Oxyrhynchus Papyrus 3161, fragment 1

In line 5, the second note, on an acute, is lower than the third, on an unaccented syllable, which violates rule 1. In line 7, the second note, on a grave, is the highest note of the line and this is indeed the highest pitch of the entire fragment, which will clearly violate rule 2. In line 8, the first note, on an acute, is this time higher than the second, on an unaccented syllable, but it is much lower than the fourth note, which falls on a grave and which, again, represents the highest pitch of the fragment. While we cannot see for sure—because of the truncation of the fragment—, it appears likely that the fourth note would once again violate rule 2. And in line 9, the high note falls on two unaccented syllables, violating rule 1. The number of examples can easily be multiplied. The point is, simply, that the musical line is not at all concerned with pitch-accent congruence. This decay of congruence was already seen in Euripides' day, some 700 years before the present fragment and need not surprise us here. Actually, we should be more surprised if we were to find a marked concern with pitch-accent agreement.

Let us turn now to the question of tonos. In Figure 1, the prominence of the note Zeta (lines 1–2, 7, 9–10) and the absence of the note Xi may be immediately noted in fragment 1. Fragment 4 (Figure 2, v. p. 19), by contrast, shows an absence of the note Zeta, with the exception of the end of line 4, and a prominence of the note Xi (lines 2–6, 10–11). In both fragments, the note Sigma (round form) appears relatively frequently, suggesting a Hypolydian tonos. But in fragment 2 (Figure 2), we find the anomolous note Kappa (line 3), and in fragment 1, Chi (line 11). It might be possible to consider all this in the Ionian tonos, but other problems would then arise. Haslam suggests that there may be a modulation by reinterpreting the notes of the tetrachord diezeugmenon in the Hypolydian as notes in the tetrachord synemmenon in the Ionian or meson in the Hyperionian. Though this process cannot be seen in these fragments because of the narrowness of the pieces and must

Haslam transcribes all the rhythmic values as quarter notes unless (1) the note carries a diseme, in which case he transcribes it as a half note, or (2) two notes appear to be grouped over a single syllable, in which case he transcribes them as eighth notes. In view of what we know from the theoretical writings, there seems to be no reason for this approach. Although we cannot determine the meter of the fragment, we can determine long and short syllables on the basis of ancient principles of quantity, and I have therefore given a double value to notes on a long syllable, subject to further modification or reinforcement by the rhythmic signs, and have used the chronos protos (here taken as equivalent to an eighth note) for the short syllables.

11 HASLAM, Texts, p. 63, n. 1.

therefore remain a conjecture, this very process will be seen clearly twice in the Leiden Euripides papyrus.

An additional noteworthy feature of fragment 2, as Haslam observes, <sup>12</sup> is the absence of notation in lines 10–16. He suggests that these lines are for spoken recitation or may be some sort of *mise-en-scène*. We will see a similar occurrence in the Leiden papyrus where it appears space has been left for material that has not been given, and I will comment further on this problem of missing notation later.

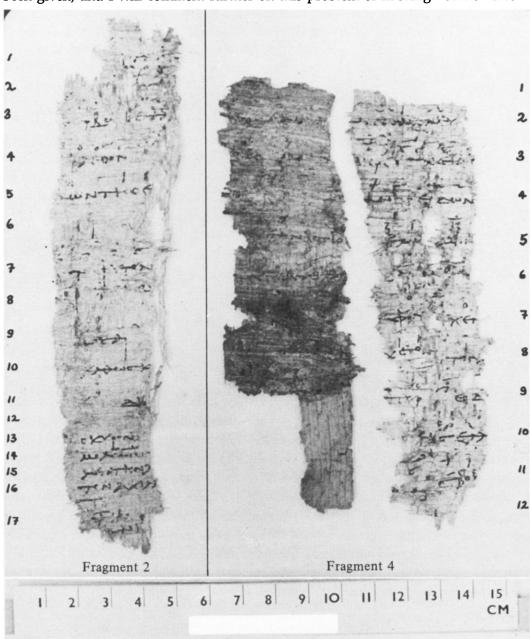


Figure 2. Oxyrhynchus Papyrus 3161, fragments 2 and 4, face Reproduced by permission of the Egypt Exploration Society, London

<sup>&</sup>lt;sup>12</sup> Ibid., p. 61.

There remains now the question of the relationship of fragment 3 to fragments 1, 2, and 4. This question may be considered with an eye to the paleography of the four fragments. If we consider the style of the hand on the reverse of fragment 3 and compare it with the reverse of fragment 1, we note some apparent differences in the shapes of the notational symbols, in the shapes of certain letters (the epsilon, for instance), and in the character of the pen strokes. These differences apparent on the back of fragment 3 accentuate similar, though less obvious differences between the face of fragment 3 (Figure 3) and of fragments 1, 2, and 4 (Figures 1 and 2). The question may therefore be raised whether fragment 3 is a textual companion of fragment 1, 2, and 4 (though certainly in other respects it does parallel them).

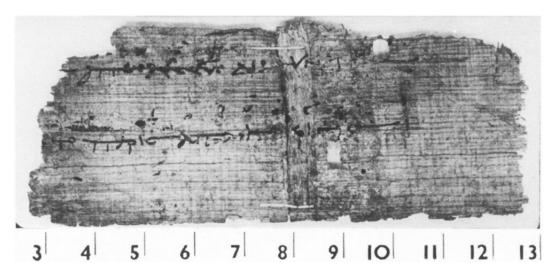


Figure 3. Oxyrhynchus Papyrus 3161, fragment 3, face
Reproduced by permission of the Egypt Exploration Society, London

The fifth fragment, *P.Oxy*. 3162, has also been edited by Haslam<sup>13</sup> (Figure 4, v. p. 21). This exhibits, once again, the Hypolydian tonos. Although it is from a different group, it simply supports the previous points and may be treated here with two brief observations. First, the fragment exhibits little pitch-accent congruence, just as we should expect. Second, the fragment offers a clearer picture of modulation in comparison with the previous fragments because of its greater width. The modulation is tetrachordal: in line 3, the tetrachord synemmenon is used, while in line 2, the tetrachord diezeugmenon is employed; and in line 4, the shift from tetrachord to tetrachord can actually be observed: nete synemmenon (I), paranete synemmenon (M), nete synemmenon (I) reinterpreted as paranete diezeugmenon, moving to trite hyperbolaion (E), and then to nete diezeugmenon (Z).<sup>14</sup>

The Oxyrhynchus fragments date from the third century A.D. and represent the type of Greek music probably familiar to the majority of the ancient Greek music

<sup>13</sup> Ibid., p. 67-72.

<sup>&</sup>lt;sup>14</sup> Ibid., p. 69.



Figure 4. Oxyrhynchus Papyrus 3162, face Reproduced by permission of the Egypt Exploration Society, London

theorists whose texts are extant, e.g., Ptolemy, Cleonides, and a number of others, all active between the second and fourth centuries A.D. For this reason, these fragments are especially important in providing musical examples for comparison with theoretical constructs. Although late, they are in fact of considerable value.

We come now to the additional exemplars of the Hymns of Mesomedes and the Koine Hormasia. None of these exemplars is listed by Egert Pöhlmann in the Conspectus codicum for the editions of these pieces in his Denkmäler altgriechischer Musik, they provide some noteworthy variants and affect consideration of the manuscript transmission. For instance, while the Hymns appear in association with the treatise of Dionysius in most of the manuscripts, they do not do so in Hamburgensis cod. phil. 110 [Berlin]. In this respect, Hamburgensis cod. phil. 110 [Berlin] is like Venetus Marcianus gr. 994 (318) and Vaticanus gr. 1772, both of which are cited and the former of which is included in Pöhlmann's stemma. Hamburgensis cod. phil. 110 [Berlin] includes notation, however, while Venetus Marcianus gr. 994 (318) and Vaticanus gr. 1772 do not. Moreover, Pöhlmann shows in his stemma Neapolitanus gr. 262 (III.C.4) and Venetus Marcianus gr. 994 (318) descending from a common ancestor, γ. But the contents of the manuscripts do not support this conjecture. Instead, Neapolitanus gr. 259 (III.C.1), an exemplar not

<sup>&</sup>lt;sup>15</sup> These exemplars, some of which have been previously noted by Jan (cf. n. 5–6), were located in the course of preparing their analytical descriptions for my catalogue of the Greek *codices musici* for RISM.

<sup>16</sup> Cf. n. 2.

<sup>&</sup>lt;sup>17</sup> PÖHLMANN, Denkmäler, p. 13.

<sup>&</sup>lt;sup>18</sup> Neapolitanus gr. 262 belongs to that class of manuscripts that links the treatises of Bacchius and Dionysius (Ps.-Bacchius) with the Dionysius epigram and the Hymns; Venetus Marcianus gr. 994 belongs to that class where the Hymns do not appear in association with the treatise of Dionysius. Moreover, Venetus Marcianus gr. 994 is a codex containing numerous mathematical and astronomical texts as well as the treatises of Bryennius, Nicomachus, and Bacchius, while Neapolitanus gr. 262 is strictly a *codex musicus* containing the treatises of Bryennius, Bacchius, Dionysius, Aristides Quintilianus, Bellermann's Anonymous, and 3.16 of Ptolemy's Harmonica.

noted by Pöhlmann, is clearly the source for Neapolitanus gr. 262 (III.C.4), as a comparison of readings will easily show. Pöhlmann's stemma, accounting for only four manuscripts, is far too simple to accommodate the additional nine exemplars.

Some examples of the notational variants may be seen in a brief overview of the Hymns as they appear in Berolinensis Phillippicus gr. 1555, Hamburgensis cod. phil. 110 [Berlin], and Salamantinensis Universitatis 2748. In Berolinensis Phillippicus gr. 1555, the Hymn to the Muse and the Hymn to the Sun appear on f. 72. The lines are, however, disarranged: on f. 72r, lines 1, 3, 5, 7, and 9 of the Hymn to the Muse appear, and lines 2, 4, 6, 8, 10, 12, 14, 16, 18, and 20 of the Hymn to the Sun; on f. 72v (in two columns), lines 22 and 24 of the Hymn to the Sun appear, followed by lines 1, 3, 5, 7, 9, 11, 13, and 15 of the Hymn to Nemesis. The remainder of column 1 on f. 72v continues with lines 2, 4, 6, and 8 of the Hymn to the Muse, and lines 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, and 25 of the Hymn to the Sun. Column 2 on f. 72v begins νεμέσεως and adds lines 2, 4, 6 (only the first two words), 8, 10, 12, 14, and 16-20 of the Hymn to Nemesis. A number of marginal annotations, which are recorded in other manuscripts by Pöhlmann in his critical apparatus, appear on f. 72r-v. This disarrangement of lines and these marginal annotations are common in the manuscripts and provide the means for a more exact consideration of the transmission of these Hymns, especially with the addition of these nine exemplars.

Hamburgensis cod. phil. 110 [Berlin] includes only a fragment of the Hymn to the Muse. Although the text is set out as if complete in five lines, the lines are actually thoroughly disarranged and the Hymn is incomplete. The lines appear in the order 1, 5, 9, 3, and 7. The notational symbols are displaced and some are missing.

Salamantinensis Universitatis 2748 exhibits the Hymns with disordered lines and some missing notation. F. 134v contains lines 1, 5, 2, and 6 of the Hymn to the Muse; 2, 6, 8, 10, 12, 14, 18, 22, 1, 5, and 7 of the Hymn to the Sun; and 1, 5, 9, and 13 of the Hymn to Nemesis. On f. 135r appear lines 3, 7, 4, and 8 of the Hymn to the Muse; 4, 16, 20, 24, 3, and 9 of the Hymn to the Sun; and 3, 7, 11, and 15 of the Hymn to Nemesis. Lines 11, 15, 19, and 23 of the Hymn to the Sun appear on f. 135v, as well as line 2 of the Hymn to Nemesis. On f. 136r, lines 13, 17, 21, and 25 of the Hymn to the Sun appear, and lines 4, 6 (first two words only), 8, 10, 12, 14, and 16–19 of the Hymn to Nemesis. Finally, f. 136v exhibits line 20 of the Hymn to Nemesis. Most of the notational symbols are present for the Hymn to the Muse (although line 9 is missing); notational symbols are absent in lines 1–6 and 14–25 of the Hymn to the Sun; and no notation appears for the Hymn to Nemesis. Here again, marginal annotations common to the manuscripts appear from time to time, and patterns in the alternation of lines may be readily observed.

In the case of the Koine Hormasia, the additional exemplars support Pöhlmann's contention that the manuscripts should be grouped into families and also indicate that the transmission was more balanced than that indicated in his stemma. Bononiensis gr. 2432, Cantabrigiensis Universitatis gr. 1464 (Gg.II.34), and Florentinus Riccardianus gr. 41 (K.II.2) are all related to Neapolitanus gr. 260

<sup>19</sup> PÖHLMANN, Denkmäler, p. 32.

(III.C.2)–though they are not necessarily descended from it–while Florentinus Laurentianus Acquisti e Doni gr. 64 is copied from Heidelbergensis Palatinus gr. 281, the source of the other side of the stemma. Bononiensis gr. 2432 also exhibits the rubric  $\Pi \tau o \lambda \epsilon \mu \alpha i \sigma \nu$  noted by Pöhlmann in Neapolitanus gr. 260 (III.C.2).<sup>20</sup>

We come at this point to the most important of the six papyrus fragments, Leiden Inv. 510, the discovery of which was announced in 1973 by Denise Jourdan-Hemmerdinger. Although this fragment has been mentioned by a few other classicists, 22 it has been the subject of study only by Jourdan-Hemmerdinger, whose discussion of the musical aspects is largely erroneous, and more recently by Giovanni Comotti, 23 whose treatment is unfortunately based entirely upon Jourdan-Hemmerdinger's description of the papyrus and is therefore subject to the same misapprehensions. Comotti does attempt a partial transcription of the fragment, but he is misled by Jourdan-Hemmerdinger's description of the notational symbols.

Any study of this fragment must begin with a fresh examination of both sides of the papyrus, for the two published photographs <sup>24</sup> are not of sufficient clarity to offer unmistakable readings of the text, notation, and spacings. Figure 5 shows the face of the papyrus and Figure 6 immediately following provides a diplomatic facsimile and reconstruction of the papyrus (v. p. 24).

The paleographic style would seem to suggest a date somewhat earlier than 250 B. C., <sup>25</sup> making this our earliest known fragment of ancient Greek music. <sup>26</sup> As can be seen in Figure 6, the papyrus preserves part of sixteen lines of text and notation, with the seventeenth easily conjectured. The lines are not arranged in cola, as they are in the *Orestes* papyrus with musical notation (*P. Wien* G 2315), nor are they arranged in stichoi, but rather in long systems. <sup>27</sup> The first seven lines may exhibit verses 1500–1509 of Euripides' *Iphigenia in Aulis*, <sup>28</sup> but the absence of any notation sets them apart from the remaining lines of the papyrus, which do exhibit notation. This absence of notation was also seen in lines 10–16 of fragment 2 of *P.Oxy*. 3161 (where the lines were, however, more closely spaced) and may be due to the failure

<sup>&</sup>lt;sup>20</sup> Ibid., p. 32.

<sup>&</sup>lt;sup>21</sup> [DENISE] JOURDAN-HEMMERDINGER, Un nouveau papyrus musical d'Euripide (présentation provisoire), in: Comptes-rendus de l'Académie des Inscriptions et Belles-Lettres (1973), p. 292–302. The editio princeps of the papyrus announced on p. 299 as forthcoming in volume 19 of Papyrologica Lugduno-Batava does not in fact appear there; only a photograph of the face of the papyrus is published as Plate I.

not in fact appear there; only a photograph of the face of the papyrus is published as Plate I.

WARREN D. ANDERSON, What Song the Sirens Sang: Problems and Conjectures in Ancient Greek Music, in: Research Chronicle of the Royal Musical Association 15 (1979), p. 1; SOLON MICHAELIDES, The Music of Ancient Greece: An Encyclopaedia (London 1978), p. 118, 290; ANNEMARIE J. NEUBECKER, Altgriechische Musik: eine Einführung (Darmstadt 1977), p. 153; SOLOMON, Orestes, p. 72, n. 3; and MARIO PINTACUDA, La musica nella tragedia greca (Cefalù 1978), p. 208–209.

<sup>&</sup>lt;sup>23</sup> GIOVANNI COMOTTI, Words, Verse and Music in Euripides' Iphigenia in Aulis, in: Museum philologum Londiniense 2 (1977), p. 69-84.

JOURDAN-HEMMERDINGER, Nouveau papyrus, p. 295; and Papyrologica Lugduno-Batava 19 (1978), plate I. My study of the Leiden papyrus is based on newly photographed color slides of the face and back.
 JOURDAN-HEMMERDINGER, Nouveau papyrus, p. 299; COMOTTI, Words, p. 69; MICHAELIDES, Music, p. 290; and NEUBECKER, Altgriechische Musik, p. 153.

<sup>&</sup>lt;sup>26</sup> The other fragments dating from the third century B.C. are P. Wien G 2315 (the Orestes papyrus), P. Wien G 29825, P. Wien G 13763-1494, and P. Zenon 59533.

<sup>&</sup>lt;sup>27</sup> JOURDAN-HEMMERDINGER, Nouveau papyrus, p. 292–293.

<sup>&</sup>lt;sup>28</sup> Ibid., p. 299.

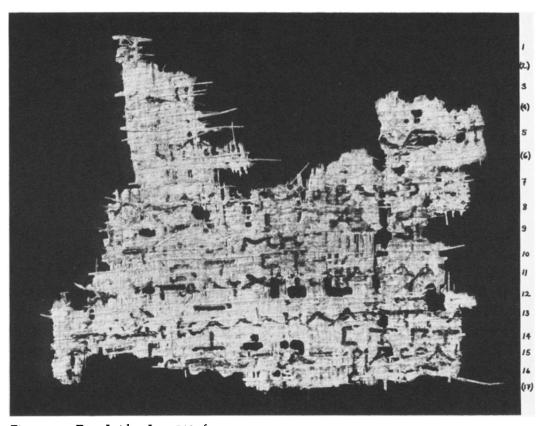
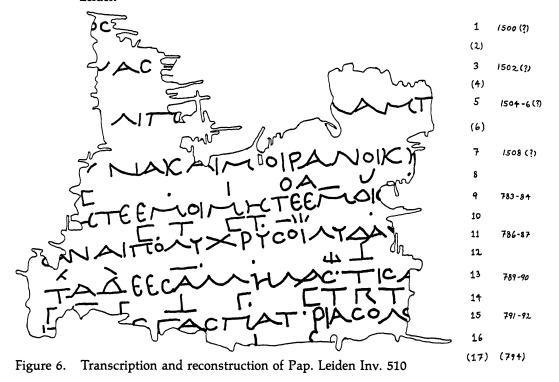


Figure 5. Pap. Leiden Inv. 510, face Reproduced by permission of the Papyrological Institute, Rijksuniversiteit, Leiden



of the notator, who is often a second hand, to complete his work. But it is striking that most of our musical fragments are choral, and it is possible that the solo parts, such as we have in what remains of these lines of Iphigenia, were left for improvisation or were so difficult to notate that the notation did not survive. Why then is there space between the lines for notation? The answer may be that since these particular lines are interspersed with two brief choral sections, which fall in the missing area of the papyrus, space was left to accommodate that notation. It must also be noted that the verses in the Leiden fragment are not textually adjacent. It is possible that the papyrus represents an anthology or a different version of the play. Comotti asserts that the fragment clearly derives from an anthology, a genuine score composed for a theatrical spectacle. These spectacles, which began in the 3d century B.C., quickly supplanted the traditional theatrical forms in the public's interest.29 Comotti also maintains certain characteristics for the compositions in these spectacles and cites as his authority the well-known Prob. 19, section 15 of Aristotle (or Ps.-Aristotle).30 This section, which deals with the structure and performance of the nomes and dithyrambs, is not necessarily speaking of theatrical spectacles and is therefore a somewhat doubtful authority on this matter. The remains of lines 1-7 are so limited and the relationship of them to lines 8-17 so uncertain that it is impossible to draw definite conclusions about their function.

Examination of the remaining lines of the papyrus may yield more fruitful and positive results. These lines represent lines 783–93 of *Iphigenia in Aulis*, one of Euripides' last plays, first produced posthumously in 405 B.C. Lines 8, 10, 12, 14, and 16 are lines of notation; the others are text. In line 8, all but the first note are reasonably clear; in line 10, all the notes are clear, though the meaning of the three vertical strokes is questionable; in line 12, the first note is unclear; and in line 14, the fifth note is uncertain. Many of the letters in the text have faded away, but enough remains to reconstruct this with little difficulty.

Now what shall we make of these lines? We must first begin with the text because the rhythm of a piece of Greek music is derived from the meter, modified in some cases by rhythmic notation. Our first task must therefore be to determine the meter of the text and to see how the text compares with the manuscript paradosis.<sup>31</sup> In Figure 7, on the left, the text is presented as it has come down through manuscript transmission. The lines may be arranged differently by different editors, but the text itself is generally clear for these lines.<sup>32</sup> On the right, the text appears as preserved in the papyrus.<sup>33</sup> A most striking feature immediately apparent is the difference

<sup>&</sup>lt;sup>29</sup> COMOTTI, Words, p. 69-70.

<sup>&</sup>lt;sup>30</sup> Ibid., p. 70, n. 7.

<sup>&</sup>lt;sup>31</sup> The articles by Jourdan-Hemmerdinger and Comotti contain detailed studies of the textual testimony offered by the papyrus. Since the textual evidence is extraneous to the subject of this paper, it will not be considered here.

<sup>&</sup>lt;sup>32</sup> The principal difficulties occur in lines 790–92. See COMOTTI, Words, p. 73–77; and JOURDAN-HEMMERDINGER, Nouveau papyrus, p. 293, 296–297.

<sup>&</sup>lt;sup>33</sup> The segments of the text within brackets represent parts not preserved in the papyrus but conjectured from the text as it is preserved in the manuscripts. Inasmuch as elision is clearly avoided in the part of the papyrus preserved, I have also removed it from the conjectured part of each line. This results in a recurring number of letters for the four lines: 48 (line 9), 62 (line 11), 48 (line 13), and 62 (line 15), which is to be expected from a

between the published text and the papyrus in the use of elision. For example, the published text at the beginning reads μήτ' ἐμοῖ μήτ' ἐμοῖσι while the papyrus has μήτε ἐμοῖ μήτε ἐμοῖσι. Thus the published text provides cretic and trochaic feet, while the papyrus provides a very clear choriambic pattern, i.e., long, short, short, long, long, short, short, long, etc. So we discover at the outset several lines of Aeolic verse. Figure 8 illustrates the rhythmic-metric scheme, bracketed to show patterns of repetition. The vertical divisions between feet are inserted only to facilitate comparison of pattern since the verse is not organized by metra.

#### Papyrus Published text μήτ' έμοι [μ]ήτε έμοι μήτε έμοῖσ[ι τέχνων τέχνοις έλπις άδε ποτε έλθοι] μήτ' έμοῖσι τέχνων τέχνοις έλπὶς ἄδε ποτ' ἔλθοι, οἴαν αὶ πολύχρυσοι Λυδαὶ [καὶ Φρυγῶν οΐαν αι πολύχρυσοι Λυδαι και Φρυγῶν ἄλοχοι αλοχοι στήσουσι παρά ίστοῖς μυθεῦσαι] τάδε ἐς ἀλλήλας· τύς ἄ[ρα μὲ εὐπλοχάμου στήσουσι παρ' ἰστοῖς κόμας ῥῦμα δακρυόεν] μυθεῦσαι τάδ' ές άλλήλας. τ[αὰ]ς γᾶς πατ ρίας όλο[μένας ἀπολωτιεῖ; διὰ σέ, τὰν κύκνου δολιχαύχενος γόνον,] τίς ἄρα μ' εὐπλοκάμου κόμας 790 όδμα δακρυδεν τανύσας πατρίδος όλλυμένας άπολωτιεῖ; δια σέ, ταν κύκνου δολιχαύχενος γόνον,

Figure 7. Text for Euripides Iphigenia Aulidensis 783-93

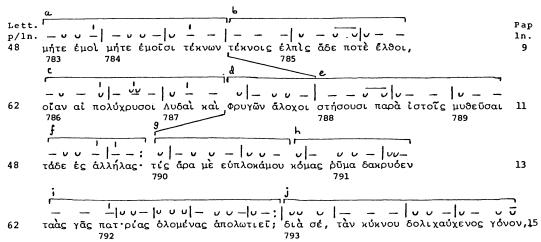


Figure 8. Rhythmic-metric scheme for Euripides Iphigenia Aulidensis 783-93

paleographic point of view. If this restoration is correct, it yields a very strong and quite consistent metric pattern, as discussed in the paper and illustrated in Figure 8. Jourdan-Hemmerdinger does not address the issue but follows the elision of the manuscripts in her restoration of the balance of each line. Comotti, however, devotes considerable attention to the meter of the fragment (p. 75-77) but sees no need to preserve a pattern of hiatus in his restoration of each line because he believes the repeated vowels are simply scriptio plena to accommodate the presence of two notes for the short syllable (this leads him to a pattern of 47, 63, and 48 letters for lines 9, 11, and 13). But this approach (1) cannot be supported by an examination of the papyrus, which exhibits two notes in only one of the three instances of repeated vowels he notes as scriptio plena, (2) is inconsistent with his treatment of the doubled alpha in line 15  $(\tau\alpha - \alpha\varsigma)$  as a true doubled vowel, (3) is not metrically sound, (4) ignores the many descriptions in classical sources of Euripides' fondness for repeated vowels, and (5) is based on Jourdan-Hemmerdinger's misleading transcription of the notational signs. PINTACUDA, La musica, p. 209, on the other hand, does see the repeated epsilons as examples of hiatus. 34 This pattern is also observed in connection with these lines by D. S. RAVEN, Greek Metre: An Introduction, 2d ed. (London 1968), p. 127. Aeolic verse is common in the tragedies of Euripides. In my scansion of the text exhibited in Figure 8, I have followed the rules of quantity as given in Aristides Quintilianus De musica 1.13-29 and Hephaestion rather then following modern metric theory.

Turning to the notation on lines 8, 10, 12, and 14, we are at once struck by the considerable number of stigmai (or, dots): two in line 8, three in 10, two in 12, and one in 14.35 The meaning of the stigme has been debated for years by scholars. Is it an ictus mark, does it indicate stress, does it show arsis or thesis, and which part of the foot ought to be called arsis? But in this fragment, its use is clear. In each line, it marks off the first metron to define the rhythmic pattern and then is used subsequently to mark the long syllable of the next metron where the pattern changes. In lines 8, 10, and 12 the initial stigme can be clearly seen and its position in the meter is indicated by the superscript vertical line in Figure 8. The stigme in line 14 would probably have appeared where there is now a hole. The subsequent stigme in line 8 is still visible and would fall precisely over the Tau of τέχνων if line 9 continued that far. This is the position where the metron changes from choriamb to bacchius. The subsequent stigmai in line 10 are especially interesting. The first falls over a syllable that would ordinarily be short. Here, however, the composer has set two notes, and he therefore wishes the syllable to sound as a long, which in fact also changes the metron from trochaic to choriambic. So there may be no confusion, he also marks a diseme to indicate the value of two chronoi-the chronos equivalent to the value of a short syllable. The third stigme in the line falls over the first long syllable of the next foot, paralleling exactly the second stigme of the previous line and marking the shift to bacchius. In line 12, the subsequent stigme marks the shift from choriamb to palimbacchius. No subsequent stigmai are visible in line 14, but it is possible one has faded over the hole over the fifth syllable,  $\alpha \zeta$ , where we should expect it to mark the next long that expands the pattern of the contracted choriamb into a hemiepes: long, short, short, long, short, short, long. The large number of stigmai make the complicated meter clear, just as they do in the Orestes papyrus with its dochmii cola.

The other rhythmic markings visible are four disemes, a pentaseme, and a sign that may be a triseme. In Figure 6, the disemes may be observed in lines 8 (the fifth note, excluding stigmai),<sup>36</sup> 10 (the fifth note), 12 (the third note), and 14 (the second note); the pentaseme in line 12 (the fourth note); and the possible triseme in line 10 (the sixth note).<sup>37</sup> These markings lengthen the value of the note or note group from a chronos protos (or eighth note, short syllable) to the value of two eighths (the diseme), three eighths (the triseme), or five eighths (the pentaseme). In other

<sup>&</sup>lt;sup>35</sup> JOURDAN-HEMMERDINGER, *Nouveau papyrus*, p. 294 (followed by COMOTTI, *Words*, p. 80) records only three stigmai. Comotti's treatment of the three stigmai noted (p. 80–81) is vitiated by his analysis of the meter.

JOURDAN-HEMMERDINGER, Nouveau papyrus, p. 294, takes the fifth note (excluding the stigme) as an upside down Tau. There is, however, no trace of a vertical over the horizontal line. In addition, the note would fall directly over the Mu-whereas the pitch notes fall over vowels or slightly to the left of them-and there is no syllable for it to sound since all the syllables to the left and right have pitch notes. Finally, the diseme makes clear here that the two previous notes sounding the hiatus between  $\mu\eta\tau\epsilon$  and  $\xi\mu\sigma\bar{\iota}\sigma$  are two chronoi protoi. A diseme was not required for the hiatus earlier in the line because a single note is sung to these syllables and there is no possibility for confusion in the placement of two notes. Comotti, of course, follows Jourdan-Hemmerdinger in all these readings.

<sup>&</sup>lt;sup>37</sup> Comotti and Jourdan-Hemmerdinger do not deal with the question of the triseme because they convert the sixth note in line 10 to a supine E. The pentaseme is recorded by Jourdan-Hemmerdinger (followed by Comotti) as an indecipherable trace of a musical sign, but the note is quite clear.

papyri, the diseme is found over the note or notes to which it applies, but here it follows the notes, a position also exhibited by the Orestes papyrus and by another Vienna papyrus (P. Wien G 13763/1494), both approximately contemporary with the Leiden papyrus. The pentaseme, in line 12, appears at the very end of a word, unlike the pitch notes, which fall over their vowels or more commonly slightly to the left. In this line, the diseme provides a double value for the note over  $\delta \epsilon$  (f#) to accommodate the repeated vowel, δε ές, while the pentaseme multiplies the value of the note five more times for the three long syllables of ἀλλήλας. Finally, the three vertical strokes in line 10 seem to be a rhythmic sign because of their position to the right of the syllable and because they are associated with a long diphthong, oi. It appears that they represent a form of the triseme not recorded in the treatises.<sup>38</sup> Jourdan-Hemmerdinger, followed by Comotti, transcribes this as a supine E, 39 but there are objections to this: (1) it is not possible as a pitch note in her suggested mode, the Hyperdorian (nor indeed are several of the other notes she proposes);40 (2) there seems to be no trace of a bottom crossbar; and (3) the position of the sign as a pitch note would conflict with the other pitch-note positions. Instead, it seems reasonable that the three strokes represent three chronoi, to which the bottom stroke, or diseme, can be added to make a pentaseme. Three chronoi complement the long or and give it a slightly greater length in relation to the preceding syllable, which would have been short by nature but has been made long by the composer.

We come now to the pitch notes. While most of these notes are quite clear, their combination is cause for some surprise: here we find a clear mixture of the so-called vocal and instrumental notations in a single line. This mixture does not appear in any of the other fragments except P. Wien G 13763/1494 where it is not clear if an instrumental interlude may be present such as appears to be the case in the Orestes fragment. 41 The square Sigma 42 seen in lines 8, 10, and 14 is exclusively represented in the so-called instrumental notation and the vertical Tau appears exclusively in the

note. But in fact, there is no difficulty with either of these notes, and Comotti is misled by Jourdan-Hemmerdinger's description. The "diablo" is simply a faded and stained A (the fourth note in line 8, excluding the stigme) and the note identified as a digamma (the first note in line 10) is simply a square Sigma where the notator's brush has slightly curved the bottom stroke.

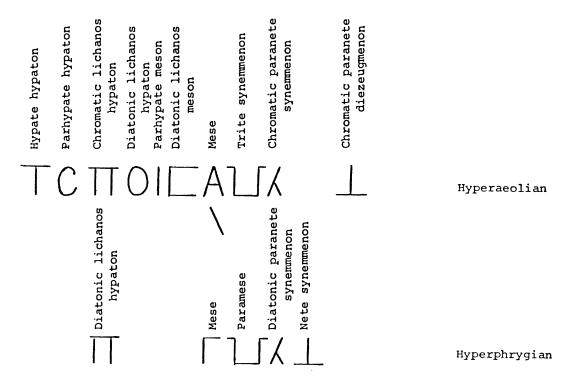
<sup>38</sup> The form in the treatises-which are late-is attested only in the Seikilos inscription (lst century A.D.) and doubtfully in the tiny P. Wien G 29825c (2d-3d century B.C.). JOURDAN-HEMMERDINGER, Nouveau papyrus, p. 294; COMOTTI, Words, p. 71, 79, 81-82.

The Iota, Theta, upside down Omega, and the lunate Sigma. Jourdan-Hemmerdinger also proposed (p. 297-298) two unidentifiable notes: a diablo and a digamma. Comotti (p. 80) discusses the meaning of the diablo, concluding that it is actually a cancelled note, X, and correctly observes that the digamma is not an anomolous

<sup>&</sup>lt;sup>41</sup> This same selected mixture, specifically involving the upside down Omega and square Sigma, appears in Hucbald's Lydian scale (see WARREN BABB, trans., Hucbald, Guido, and John on Music: Three Medieval Treatises, ed., with introduction by Claude V. Palisca, Music Theory Translation Series 3 [New Haven 1978], p. 9, 38). The square Sigma may have been preferred to the Zeta because the Zeta is also the partner of the upside down Omega and the notes might therefore be confused. This is the only spot in the Greek notational system where two nearly adjacent pitches are represented by the same symbols, reversed, in the so-called vocal and instrumental notation. By using the square Sigma, the twin note Zeta may be eliminated from the sequence. <sup>42</sup> Alypius refers to this note as a horizontal Pi, but the shape of the note is nothing like the pitch-note Pi appearing in line 14. Instead, the shape is exactly like the transitional Sigma form between  $\Sigma$  and C (see VIKTOR GARDTHAUSEN, Griechische Palaeographie, vol. 2: Die Schrift, Unterschriften und Chronologie im Altertum und im byzantinischen Mittelalter, 2d ed. [Leipzig 1913], p. 98-99). In view of the early date of development and archaicism of the shapes of notes in the so-called instrumental notation (within which this note appears in the later treatises), it seems more accurate to refer to the note as a square Sigma.

so-called vocal notation. I do not think the square Sigma can be thought of as a scribal variant for lunate Sigma because lunate Sigmas abound in the text and most of a pitch-note lunate Sigma can be observed in line 16 of the papyrus. It therefore appears that the two notational systems originally functioned in some combination—a hypothesis intimated in 1957 by Isobel Henderson<sup>43</sup> and now, I think, clearly demonstrated.

With respect to tonos, the notes fit quite comfortably into the Hyperaeolian mode,44 with shifts from tetrachord synemmenon to tetrachord diezeugmenon, and into the Hyperphrygian mode, with modulations from the one to the other by common-tone, just as the theorists say modulations might be accomplished. 45 These two high tonoi also suit the character of the feminine lamentation that is the subject of the text. Figure 9 exhibits the notes in the two tonoi and Example 2 presents a transcription of the fragment in these tonoi, following the rhythmic pattern and notation previously considered.

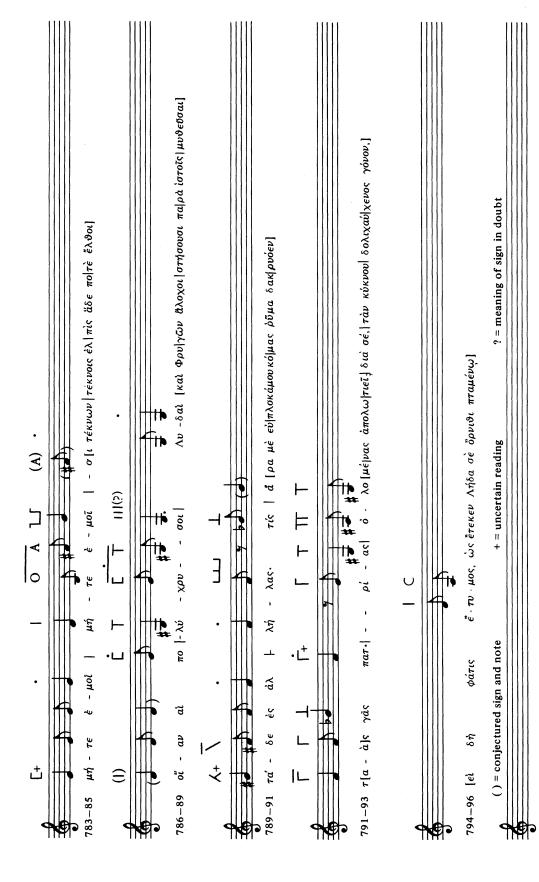


Pitch notes, tonoi, and modulation pattern for Pap. Leiden Inv. 510

<sup>&</sup>lt;sup>43</sup>ISOBEL HENDERSON, Ancient Greek Music, in: Ancient and Oriental Music, ed. Egon Wellesz, New Oxford History of Music 1 (London 1957), p. 359-360. See also COMOTTI, Words, p. 78.

JOURDAN-HEMMERDINGER, Nouveau papyrus, p. 298, proposes Mixolydian (Hyperdorian); CO-MOTTI, Words, p. 82, tentatively suggests Phrygian but admits that several of the notes do not fit. Comotti is also troubled by the presence of the horizontal line (or, as Alypius calls it, a horizontal Iota) and the supine E because he has taken these as pitch-notes. He proposes (p. 81) that they might be raised an octave but agrees that there is no particular evidence to support such a modification. Of course, as we have seen, these are not pitch-notes at all.

45 For example, Cleonides 13 or Aristides Quintilianus 1.11.



Example 2. Transcription of Euripides Iphigenia Aulidensis 783-96 from Pap. Leiden Inv. 510

What does this transcription reveal about the style of the piece? First, it shows that the piece pays little attention to pitch-accent congruence, as was also noted in the Oxyrhynchus papyri. It does, however, exhibit some expressive use of pitch. In the first and fourth lines of the transcription, the highest notes fall on circumflexed syllables and the highest note of the fragment falls on the first word of the interrogative passage: on  $\tau(\varsigma)$  (who?). We can also see that the melody stresses standing tones: in the first line the diatonic lichanos meson (square Sigma) moving to the mese (A) by way of decorative notes; in the second line moving from whatever may be the opening tones to the hypate hypaton (T); and in the third line cadencing before the interrogative quotation on the mese (\). At the end of the third line, now in the Hyperphrygian mode, we begin on the nete synemmenon (upside down T) and at the beginning of the fourth line, we cadence on the mese ( $\Gamma$ ). The end of the fourth line, now again in the Hyperaeolian, stresses the hypate hypaton. All of these are standing notes.

The transcription also illustrates Euripides' habit of repeating syllables, either for length as in the fourth line, first word,  $\tau\alpha$ –à $\varsigma$ ; or for hiatus as in the first and third lines:  $\mu$ ήτε ἐμοῖ  $\mu$ ήτε ἐμοῖοι and τάδε ἐ $\varsigma$ . This same feature may be seen in the Orestes papyrus in line 6, where ὡω $\varsigma$  appears. Of course, the remarkable division of the third word in line 4,  $\pi\alpha\tau$ ·  $\varrho$ ία $\varsigma$ , is also an extraordinary expressive device. <sup>46</sup> Such treatment of text by Euripides was the subject of comment by Dionysius of Halicarnassus and scorn by Aristophanes, who puts it bluntly:

But he from all things rotten draws his lays, From Carian flutings, catches of Meletus, Dance-music, dirges. You shall hear directly. Bring me the lyre. Yet wherefore need a lyre For songs like these? Where's she that bangs and jangles Her castanets? Euripides' Muse, Present yourself: fit goddess for fit verse.<sup>47</sup>

Aristotle, however, took a different view:

Art is cleverly concealed when a speaker puts together words chosen from the language of ordinary speech, as Euripides does, who was the first to show the way.<sup>48</sup>

We earlier saw how the music might lengthen what would normally be a short syllable or shorten what would naturally be long, e.g., the sixth syllable in the second line, which here receives two notes, and the sixth syllable in the third line, which is truncated to a single chronos, though long. This perfectly fits Dionysius of Halicarnassus' comment that music shortens the naturally long and lengthens the naturally short.<sup>49</sup> It also contradicts A. M. Dale's dismissal of Dionysius'

<sup>&</sup>lt;sup>46</sup> JOURDAN-HEMMERDINGER, *Nouveau papyrus*, p. 296, comments further on this separation. I have taken the two punctuation points within the text (lines 13 and 15), the στιγμαὶ τέλειαι, as equivalent to a chronos protos, which also suits the metric exigencies.

Euripides' habit of repeating syllables, e.g., εἶ ει ει ει ει ει ει ει ει λίσσετε.

48 Rh. 3.2.5. Translation by D. W. LUCAS, Euripides, in: The Oxford Classical Dictionary, 2d ed. N. G. L. Hammond and H. H. Scullard (Oxford 1970), p. 421.

49 De comp. verb. 11.

observation, a dismissal typical of modern metric studies. She writes: "Whatever the applicability of this to the music of Dionysius' own time, such wholesale inversion is unthinkable for fifth-century music." In fact, it seems increasingly clear that the ancient theorists were accurate in their analyses. Yet this conclusion is not shared by many modern students of metrics, for instance J. D. Denniston, who writes in one place: "The ancient metricians, of whom Hephaestion is the chief, do not help us greatly towards an understanding of Greek metric, and it is unlikely that they represent a tradition dating back to the classical period." I would propose, rather, that the fragments support the ancient commentators most clearly.

Finally, the matter of chromaticism and modulation must be briefly considered. The transcription exhibits considerable chromaticism in the use of the tetrachord synemmenon and in the use of chromatic movable tones: the Pi in line 4, the Hemialpha in line 3, and the upside down Tau in line 3. This last note is also the focal point of the modulation from the Hyperaeolian to the Hyperphrygian since it is a common tone in both, as are the preceding notes in line 3. The modulation scheme is shown in Figure 9.

\*

With the addition of these new fragments, there are now known 41 authentic fragments of ancient Greek music ranging across seven centuries from the third century B.C. to the fourth century A.D. Some of the pieces are of considerable length and the majority are at least of sufficient length to lend themselves to the type of analysis demonstrated with the Leiden papyrus. From such analyses, we can discover specific examples of many of the theoretical points posited in the Greek treatises, for the music and the theory complement each other in ways illuminating to both. The task, I would propose, is one worthy of renewed musicological attention.

<sup>&</sup>lt;sup>50</sup> A. M. DALE, The Lyric Metres of Greek Drama, 2d ed. (Cambridge 1968), p. 206.
<sup>51</sup> J. D. DENNISTON, Metre, Greek, in: The Oxford Classical Dictionary, 2d ed. N. G. L. Hammond and H. H. Scullard (Oxford 1970), p. 679. DALE, Lyric Metres, p. 34, n. 1, expresses the same sort of sentiment on a question of dactylic meter: "Passing references in ancient metrical theory are of no great importance to the argument either way; neither the affirmative of Aristides Quintilianus and Marius Victorinus nor the denial of Hephaestion and his commentators need influence us."



Researches into the Origin of the Organs of the Ancients

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# Researches into the Origin of the Organs of the Ancients

by

## Kathleen Schlesinger.

(London.)

## Part I. Introductory 1).

It has been observed that musical instruments tend to evolve in the same order in each growing civilization, keeping pace with man's progress in the industrial arts, in the sciences of acoustics, mechanics and mathematics. First of all the influence of rhythm makes itself felt, and stamping and hand-clapping herald the first dawn of the as yet far distant art of music. And these natural instruments of percussion are called into requisition to accompany the primitive dances of primeval man, which constitute the earliest unwritten drama, just as the songs with instrumental accompaniment of the chorus fulfilled this purpose in the immortal Drama of the Greeks.

The wild, sweet music of the wind in the reeds?) or the whistling of his own breath through the bone of some animal which he was preparing for use, no doubt suggested to man the possibility of turning pipes of different kinds into musical instruments, thus laying the foundation of the large class of wind instruments.

<sup>1)</sup> To do full justice to this interesting subject one ought to be a good classical scholar, an egyptologist and an orientalist, in order to be able to investigate at first hand all the available sources, instead of having to rely upon more or less accurate translations of the musical technicalities. Unfortunately I possess none of this requisite knowledge, and this article, which does not claim to be exhaustive by any means, is in fact but the result of some researches made during the last few years, and of which a small part appeared in »Music« (London, April to November 1898). If some quotations from the classics should seem to have furnished but scant additional knowledge, and if it should seem that little use has been made of them in the text, this is in most cases owing to the great difficulty I have found in extracting the real meaning of the classical writer from the point of view of musical archaeology; the passages are therefore merely brought forward in the hope that others may be able to test their practical value in relation to the subject under treatment.

<sup>2)</sup> Et zephyri cava per calamorum sibila primum Agresteis docuere cavas inflare cicutas. Lucretius, lib. V. l. 1381 and 1382 (ob. cir. B. C. 50).

The note given by the twanging of the bow-string or of any tense cord or sinew was the signal for the rise of stringed instruments whose advent always indicates that a somewhat higher state of development has been reached.

This progression of percussion, wind and strings may be noted at the present day among the savage tribes of the uncivilized world; and the progress that civilization has made in any nation may generally be gauged by the degree of perfection attained in the musical instruments of any one of these classes. The Egyptians and the ancient Greeks excelled in the use of stringed instruments, estimating them, during the best period of their musical history, far above wind instruments; of this, the myth of the triumph of Olympus over Marsyas forms a fitting allegory. With the Romans, on the contrary, the love of wind instruments as a class was wide spread, and the coarse tones which would have made the Greeks of the golden age shudder were by the Romans tolerated at private as well as public festivals; many more examples will suggest themselves to readers.

History shows a tendency to repeat itself, and it would not be impossible that each of the ancient civilizations of Egypt, Chaldea, China, and later Greece, should have discovered for themselves the musical capabilities of reeds; we can however feel nearly certain that reed and stringed instruments originated in Egypt and spread thence to Asia and Europe.

This does not in any way upset the theory of progression above recorded of percussion, wind, and strings, in the evolution of musical instruments, for until the nations are ripe for it they cannot assimilate or take advantage of any invention or discovery introduced from without; this I have myself frequently observed to have been the fact with musical instruments during the early centuries of our era.

Samuel Laing<sup>1</sup>) computes that the earliest authentic records in Egypt date back as far as 5000 B. C. and that civilization was not even then in its infancy. Discoveries made since the book was written may possibly serve to remove the prehistoric boundary still further back.

Plato<sup>2</sup>) has something to say on the subject of the treatment of Art by the Egyptians: \*Egypt, he says, has fixed forms of art which have existed for ten thousand years. To this day no alteration is allowed either in these arts (painting and sculpture) or in music at all.« The earliest mythical records of Greece do not reach further than cir. 2000 B. C., and she owes the civilization she imbibed so greedily to Egyptian, Chal-

<sup>1)</sup> Samuel Laing, Human Origins, London, 1892.

<sup>2)</sup> Plato, Leges II, 656. English trans. by Jowett, Oxford, 1892.

dean and Phoenician colonists. The great aptitude of the Hellenic race for all sciences and intellectual pursuits, and its keen perception of the beautiful in Art, brought Greece by rapid strides to a degree of excellence as yet unrivalled; set her in fact on a pinnacle to serve as an example for other races when they in turn became ripe for civil and intellectual development. What matter although the glories of Greece as a nation waned and departed, that her decline like that of her greatest pupil and rival, Rome, left a void in the world of art for centuries?

Many of her treasures remained as a legacy and ideal standard to the Western nations of Europe to aid them in finding out the principles of the lost arts, which they had to learn step by step from the beginning. There was however one of the arts, the greatest of them all, since the spiritual is immeasurably greater than the material, Music, whose development does not seem to have gone hand in hand with that of its sisters. It has not even yet reached the limits of approximate perfection like sculpture and painting; it has had no decline, at least none that can be proved, since most of the music of the Greeks and Egyptians is practically lost to us.

As the intangible mysteries and longings of the soul are the themes which Music aims at depicting, it is easy to see why its development has been slower than that of the sister arts and why its laws can never become absolute. Obscurity shrouds the origin of most musical instruments, which for obvious reasons do not survive (with very few and precious exceptions); and posterity, entirely at the mercy of artists and writers, and being dependent on them for knowledge of the vanished instruments, must perforce be content with inadequate allusions and descriptions, and representations in sculpture and painting all more or less correct then as now.

## Part II. The Pipe and the Syrinx.

The hydraulic and pneumatic organs of the ancients were practically one and the same instrument, differing only in the mechanical principle of one of its essentials, the compression of the wind supply, which in the case of the hydraulic organ was effected by water and in the pneumatic by means of the bellows.

What little is known of the evolution of the organ before hydraulic power was applied to it is common to both hydraulic and pneumatic organs.

The organ of the ancients was but a simple contrivance compared to the magnificent instruments of our day. It consisted of three main parts: 1) of a set of reeds or pipes of various lengths; 2) of a contrivance for supplying the pipes with wind and thus enabling them to speak; 3) of a

system for controlling the distribution of the supply of wind separately to each of the several pipes.

It is clear therefore that the pipe and the syrinx (pandean-pipe) were the prototypes of No. 1, while the bellows and the bag-pipe — which was but the application of the former to the reed — foreshadowed No. 2. As to the third of these parts of the organ, it was borrowed from such common objects as carpenters made, such as boxes with lids running in grooves [άγκωνίσκος] and levers.

It is impossible to consider seriously the opinions of such writers 1) who repudiate the syrinx and bag-pipe as fore-runners of the organ. The three principal kinds of pipes in use in the organ, the open, the stopped and the reed, were known to the ancients. The development of the pipe took a natural course; having discovered the musical properties of simple reed pipes it was but one step further to find that the sound varied with the length. That done, and finding it inconvenient to have to handle each reed separately, some shepherd of old bethought himself of wax to fasten them together, and rifled a bee's nest on a neighbouring tree to supply his need; his syrinx or pandean-pipe was then complete.

Virgil tells us that Pan was the first to join the reeds together with wax: »Pan primus calamos cera conjungere plures Instituit.«3)

Tibullus mentions the use of wax and the arrangement of the reeds:

»Fistula (syrinx) cui semper decrescit arundinis ordo

Nam calamis cera jungitur usque minor.«4)

From Virgil again comes the information that seven pipes of different lengths were used:

» Est mihi disparibus septem compacta cicutis Fistula «5) (syrinx).

The syrinx is evidently of the highest antiquity and its invention must have followed closely on the discovery of the single reed. The principle on which the syrinx works is practically that of the stopped pipe of the present day. Reeds were first used for the purpose — those growing on the shores of Lake Orchomenus being very greatly esteemed by the Greeks<sup>6</sup>) — later horn, ivory, bone, wood and metal were all used to make the pipes. We must not imagine that these various materials were adopted to vary the tone of the instrument, it has been practically demonstrated in our day that material has very little influence on timbre; but it was rather for the sake of durability, and because in some countries reeds were not available. These pipes composing the syrinx were stopped at one end, so that the column of air had to travel twice the length of

<sup>1)</sup> See article *Hydraulus* by C. E. Ruelle, Dictionnaire des Antiquités Grecques et Romaines, Daremberg et Saglio, Paris 1897, p. 312 (a).

<sup>3)</sup> Virgil, Ecl. II, 32 (ob. B. C. 19). 4) Tibullus, lib. II, 5, 31 (ob. B. C. 18).

<sup>5)</sup> Virgil, Ecl. II, 37. 6) See Pindar, Pyth. XII, Antis. 2.

the pipe, giving a note nearly an octave lower than that produced by an open pipe of equal length. The breath was blown horizontally across the open end, impinging with force against the sharp inner edge, and setting the whole column of air in vibration. Many of the ancient Egyptian flutes were sounded in a similar manner.

The syrinx consisted of from 3 to 9 or even more reeds according to time and place, bound together generally with the open ends or embouchures in a horizontal line, and the stopped ends (usually stopped by nature, for the reeds were cut off just below a knot) gradually decreas-

ing in length as described by Tibullus, from left to right, so that the deepest notes were to the left as in a modern organ. Whether by an error of the sculptor or delineator, I know not, but some pan-pipes seem to have their embouchures at the graduated end; as for instance on the relief-work of a marble sarcophagus in the Museum at Florence 1), representing Ulysses passing the Syrens, three in number, one playing on double-flutes, the second on a five-stringed lyre and the third on a syrinx which is so arranged that the stopped ends are horizontal.

Each pipe gave out one note, but by overblowing, i. e. increased pressure of the breath, harmonics could be obtained from the pandean-pipe. How soon the practice was discovered by the ancients, or whether it was used in the case of the syrinx, is doubtful. The Greeks presumably did not apply this knowledge to the syrinx before the day of Aristoxenus<sup>2</sup>) (4<sup>th</sup> cent. B. C.), or else the contrivance he mentions (which is referred to further on) would hardly have been necessary.



A syrinx from Tarsus in Cicilia (200 B. C). From »Lares and Penates« by W. B. Barker.

For a description of how the syrinx was played by moving the lips from pipe to pipe we turn to Lucretius:

»Unco saepe labro calamos percurrit hiantes.«3)

Although the Egyptians used so many different kinds of flutes and pipes, and were familiar with the principle of the drone<sup>4</sup>), we do not

<sup>1)</sup> A drawing of the sculpture may be seen in Naumann's History of Music (1st English Edition, Cassell), p. 125, fig. 86.

2) Aristoxenus 21, 1.

<sup>3)</sup> Lucretius, De Rerum Naturae, IV, 590.

<sup>4)</sup> Concerning the music of the ancient Egyptians, see »Manners and Customs of the Ancient Egyptians« by Sir Gardner Wilkinson, vol. I; and for the drone p. 487.

find the syrinx among the musical scenes depicted on the tombs, but it was known to the Chinese, to the Hebrews, and to the Greeks.

A probable explanation of the absence of the syrinx in Egypt, is that the object of the pandean-pipe being to provide a scale or sequence of sounds by means of columns of air of different lengths, the simplest means of attaining this end was to cut several reeds of the requisite The Egyptians however had discovered a still more ingenious method of obtaining columns of air of different lengths, which did not necessitate removing the lips from the embouchure of one pipe to the next; they found out the principle of shortening the column of air in any given open pipe by boring lateral holes in it, and of stopping these with the fingers in order to lengthen the column. This discovery, which may have caused the Egyptians to relegate the more primitive instrument to the shepherds and nomadic tribes, was a very important one for the history of wind instruments; and to the system of boring lateral holes in tubes or pipes we owe all the wood-wind and much of the brass in the modern orchestra. But although the priestly class of musicians in Egypt may have despised the syrinx, a time came when other nations valued it, and experimentalizing upon it in many directions gave us what by degrees developed into the lordly organ. Henceforth the stopped pipe of the syrinx and the open pipe of the flute went their several ways, diverging more and more, until some there were who even forgot that their common ancestor was the primitive pipe. The musical instruments of China supply a very valuable link in the history of the organ, and according to Chinese authorities their antiquity is such as to command attention next to those of Egypt; unfortunately however the difficulties of the language preclude any possibility of independent research in this field, and one can but repeat what others have said before, accepting Chinese reports and traditions with reserve.

Professor Douglas<sup>1</sup>) mentions the Chinese »Book of Changes « as the earliest published work on which we can lay our hands; it was written by Wan-Wang while undergoing a term of imprisonment for some political offence in 1150 B. C. I do not know that the Book of Changes contains any information on music but I cite it on account of its antiquity.

»The Book of Odes«, compiled by Confucius who flourished about 550 B. C., consists of songs collected during periods long preceding any of which we have any knowledge; before the consolidation of China into an empire, and when the feudal states paid homage to a common sovereign at whose court were music-masters and historiographers, whose business it was to collect and set to music the songs of the people.

<sup>1)</sup> Encyclopaedia Britannica, Ninth Ed., Art. »China«.

When Confucius began his compilation, he found himself confronted with an official collection of over 3000 songs, which he carefully examined, rejecting the duplicates and worthless specimens; and he named the collection of 311 survivors The Book of Odes«. Perhaps one of these two books may contain the Treatise of music dating from the 11<sup>th</sup> cent. B. C. which, I somewhere read, contains a reference to the Siao, the ancient pandean-pipe of the Chinese, and which M. Carl Engel 1) says is still in use under that name at the present day in China; it possesses 16 bamboo pipes, while the *Koantsee* another variety has but 12. Further we learn that Mr. S. S. Hill<sup>2</sup>) found the Siao in the hands of Chinese missionaries in Maïmatchin, a well-known trading place on the borders of Mongolia. If we are to believe Chinese traditions, their stringed instruments were invented by Fohi, the founder of the Empire (cir. 3000 B. C.), and their wind instruments would naturally be considerably older still.

The earliest mention of the word »organ« in the English Bible is in Gen. IV, 21: And his brother's name was Jubal and he was the father of all such as handle the harp and organ.« The marginal date given here is cir. 3875 B.C., and Moses wrote the account about 1500 B.C. The Hebrew word aogab or ugab used in this verse is at the present day a generic term for wind instruments and occurs three times besides in the Bible: in Job XXI, 12, "They take the timbrel and harp and rejoice at the sound of the organ«; in Job XXX, 31, »My harp also is turned to mourning and my organ into the voice of them that weep«; in the last verse the organ is compared not to the voice of one person but of many, possibly on account of its being an instrument of many pipes; finally we find ugab for the fourth time in Ps. 150, 4, »Praise him . . . with stringed instruments and organs.« This is one of the liturgical psalms for use in the Temple, and it is therefore the first mention of the introduction of the organ, however primitive, into religious services.

Although the ugab is translated »organ« in our English version, this is no proof that the organ was known in the days of Moses, for the translators were apparently not versed in musical matters, and have merely given what seemed to them the best equivalent; thus we get for Kithara harp, and for sa(m)buka sackbut! The names of instruments which occur in the various translations of the Bible are chiefly valuable in musical archaeology from the fact that during the middle ages the monks of the Scriptorium, who were often musical and acquainted with various instru-

<sup>1)</sup> Musical Instruments, (South Kensington Museum Handbook, No. 5) by Carl Engel, p. 46.

<sup>2) »</sup>Travels in Siberia« by S. S. Hill, London 1854, vol. II, p. 64.

ments, occasionally represented them in the illuminations and thus gave a clue to the instrument which went by the name in their day.

There is every reason to believe that *ugab* in Gen. IV, 23 meant \*pipe\* being the simplest form of the wind instruments, but between the first and last mention there is a lapse of about 1000 years 1) and it is scarcely probable that the ugab of Psalms was the same instrument as that of Genesis; it was either a syrinx or an instrument partaking of the nature of both syrinx and bag-pipe, not unlike Father Kircher's Magrakitha (Fig. 2) in principle if not in outline.

As so much importance is attached to the Greek translation of the Septuagint by some commentators and writers on music, it is instructive to see by what terms the »learned seventy« rendered ugab. In Genesis the word is translated  $\psi a\lambda \tau \dot{\eta} \varrho \iota o \nu$ ; in both the references in Job  $\psi \alpha \lambda \mu \dot{\rho} \varsigma$ , and in Psalm 150  $\ddot{\nu} \varrho \gamma \alpha \nu o \nu$ ; the first of these, psalterion, is a stringed instrument of which the strings were plucked, psalmos was a song, and organon was used both for organ and as a general term for instruments; and as »psalterion« is applied in the Septuagint to no less than four different instruments, embracing percussion, winds, and strings, it does not seem as though much reliance could be placed upon the translation in musical matters.

The next mention of an instrument with pipes is in Daniel III, 5, in the Bible (cir. 580 B. C.): "That at what time ye hear the sound of the cornet, flute, sackbut, psaltery, dulcimer and all kinds of music, ye fall down and worship the golden image that Nebuchadnezzar, the king, hath set up." The Chaldee word — for this chapter was written by Daniel in Chaldee — is mashrokitha, which the Septuagint gives as syrinx, while commentators are divided between double-flutes and syrinx. Common sense seems to me to favour the former hypothesis, since the double-flutes appeared on Assyrian monuments of the 8th cent. B. C. in scenes of public ceremony, whereas the syrinx has not been found figured up to the present date; moreover, and perhaps on that very account, it was not as suitable an instrument for a mixed band. On the other hand the derivations offered are in favour of the syrinx.

A Chaldee-German lexicon gave mashrokitha  $\implies$  Hammel-Leiter, i. e. leader of the sheep, and therefore equally applicable to the syrinx and to the double-pipe; in Syriac mashrukitha means syrinx, fistula or whistling. Others again<sup>2</sup>) consider that the word is the result of a compromise between the Hebrew-Aramaic stem  $\forall v \in V$  whistle and the Greek  $\sigma v \rho v \gamma \xi$ ; the prefix

<sup>1)</sup> I count the years from the dates of authorship, not from the life-time of Jubal, therefore from Moses to Ezra and Nehemiah.

<sup>2)</sup> See >Hebraïca«, Chicago, 1887, October Vol. IV, part 1, p. 9. Hartwig Derenbourg's Article: >The Greek words in the Book of Daniel«.

and termination are Semitic, the author of the essay remarks, but the body of the word *shroki* bears a resemblance to *syrinx*. I was talking to an orientalist about this word and he pointed out that \*ma« was prefixed to signify an instrument and that the suffix \*itha« indicated an abstract-feminine singular; further that the probabilities were against mashrokitha being the Chaldee for double-pipes, since all duals and pairs had a special particle prefixed in Hebrew.

All our doubts and hypotheses will however probably be removed some day by the discovery of some clue found in a cuneiform inscription; until then there seems no way of settling the point satisfactorily.

Before passing on, a few words should be added concerning the Assyrian double-pipes; they are to be seen on two bas-reliefs brought to the British Museum from Kouyunjik as a part of the result of the excavations conducted in 1853 and 1855; the sculptures date from the 8th cent. B. C. The use of these and other instruments with them at religious and popular ceremonies seems to allow the inference that these instruments were centuries older than the monuments, and as the Assyrian sculptures have been observed to be accurate in many small details, we may safely place reliance on these monuments. Their evidence is moreover borne out by the fact that almost all the instruments on the bas-reliefs in the British Museum and at the Louvre are in use to this day in the East; they are still played and held as indicated in the sculptures and the curious customs and ceremonies with which the instruments were connected have survived to the present day 1).

I feel inclined to reject the syrinx as the mashrokitha of Daniel III, because if it had been used at the imposing ceremony on the plain of Dura, it would doubtless have been found on the monuments figured in similar scenes.

In Greece the syrinx was evidently of a high antiquity, for its invention is ascribed to Pan, and tradition explains its double name Syrinx and Pan-pipe by the following legend?):

»Syrinx, an Arcadian water-nymph, daughter of the river-god, Ladon, was beloved by Pan, but she did not reciprocate his passion. To escape from his importunities, the nymph fled from him and implored the aid of her sisters, who changed her into a reed. Pan, undaunted, possessed himself of the reed, cut it into seven, some say nine, pieces, joined them together in gradually decreasing lengths, and formed the instrument bearing the name of his love. Henceforth he was seldom seen without it. In Greek and Roman works of art it has at all times been the chief attribute of Pan and of the Satyrs.«

<sup>1)</sup> Carl Engel, The Music of the Most Ancient Nations, pp. 6 and 78.

<sup>2)</sup> Serv. ad Virgil, Ecloga II, 31 also Ovid, Metam. I, 691 etc.

A version of this legend appears in one of those curious poems which were known as *Idyllia figurata*<sup>1</sup>), because they pictured an object by means of the number, position and length of the lines. The poem (which is given below) is by Theocritus, a Greek pastoral poet of Syracuse, who flourished at the beginning of the third century B. C., and whose idylls are simple pictures of the rural life of Sicily.

## The Syrinx.

δὲ μᾶτεο, Οὐδενὸς εὐνάτειρα, Μαπροπτολέμοιο Αντιπέτροιο ίθυντῆρα. 30ov τέχες ουχί Κεράσταν, όν ποτ έθρεψατο ταυροπάτωρ, άλλ' ού πιλιπές αἶθε πάρος φρένα τέρμα σάκους οὔνομ Όλον δίζων ὂς τᾶς μέροπος πόθον χούρας γηουγόνας έχε τᾶς άνεμώδεος, Μοίσα λιγὺ πᾶξεν ἰοστεφάνω έλχος, ἄγαλμα πύθοιο πυρισφαράγου, σβέσεν άνορέαν **ισανδέα** öς Παπποφόνου, Τυρίαν τ'ερδύσατο. ῷ τόδε τυφλοφόρων ἐρατόν παμα Πάρις θέτο Σιμιχίδας. ψυχὰν ἀεὶ, βροτοβάμων, οἶστοε Σαέττας στήτας χλωποπάτωο, ἀπάτωο, λαρνακόγυιε, χάροις. μελίσδοις άδὺ έλλοπι χούρα Καλλιόπα, νηλεύστω.

The syrinx is mentioned several times in Homer's Iliad and in the Hymn to Mercury:

 $*\alpha \mathring{v} \lambda \tilde{\omega} v \sigma v \varrho (i \gamma \gamma \omega v \tau' \mathring{\epsilon} v \circ \pi \mathring{\gamma} v \delta \mu \alpha \delta \acute{o} v \tau' \mathring{\alpha} v \vartheta \varrho \acute{\omega} \pi \omega v ^{<2}).$ 

We hear that Agamemnon sleepless among the restful chiefs, on gazing toward the plain of Troy, wondered at the many fires before the city and at the sound of war and the din of the oboes and pan-pipes. These are surely curious instruments to hear amidst the sounds of war, and it must have required a great number to make a din penetrating enough to reach the ears of Agamemnon above the noise of battle.

Further on 3) we find a description of the immense shield fashioned by Vulcan, on which appear two contrasting scenes of peace and war.

<sup>1)</sup> The Syrinx by Theocritus. Brunck, Analecta Veterum Poetarum Graecorum, I, p. 304. (Obige Fassung nach E. Hiller, Theokrits Gedichte, Leipzig 1881.)

<sup>2)</sup> Homer's Iliad., X, 13.

<sup>3)</sup> Homer's Iliad, Polyglot (Florentiae 1837), XVIII, 526.

In the latter some townsmen are seen to prepare an ambush for the unsuspecting foe, mere shepherds with their flocks, who advance playing with delight on their pan-pipes,  $\tau \epsilon \varrho \pi \delta \mu \epsilon \nu \sigma \iota \sigma \iota \varrho \iota \gamma \xi \iota$ . Were the Homeric epics not of too uncertain an authorship and age, one might from these passages assume that the syrinx was as much at home in Asia Minor as in Greece.

Hesiod, an epic poet born in Bœotia in the 8<sup>th</sup> century B. C., talks of the \*sweet-voiced syrinx giving out a song from its delicate mouth «¹).

Plato (born at Athens 429 B. C.), whose writings teem with instructive similes derived from music, belongs by his aspirations to the best period of Greek music, although in reality the seeds of decadence had already been sown, a fact which draws from him many sorrowful comments. From him we need not expect more than a passing reference to the syrinx or to any other wind instrument except the flute, for the following passage from the »Republic« 2) clearly shows the estimation in which wind instruments were held by him, and therefore by those who had helped to pilot the art of music to the high position it held in the State. The conversation having turned upon the part music was to play in the ideal republic, it was agreed that none of the (spurious growth of) many-stringed and curiously harmonised instruments should be preserved; then Socrates, in whose mouth Plato places the words of wisdom, continues thus: But what do you say to flute-makers and flute-players? would you admit them into our State, when you reflect that in this composite use of harmony, the flute is worse than all the stringed instruments put together; even the panharmonic music is only an imitation of the flute? — Clearly not! is the rejoinder. — There remain then only the lyre and the harp [this should be kithara, not harp, K. S.] for use in the city; the shepherds may have a syrinx in the country, I suppose etc. Which hypothesis was likewise granted. — The preferring of Apollo and his instruments, to Marsyas and his instruments is not at all strange, I said. Here we may observe that all stringed instruments as a class are by Plato derived from Apollo, and the wind instruments from Marsyas, the Phrygian, thus acknowledging the indebtedness of Greece to Asia for the introduction of wind instruments 3). The legend relates

<sup>1)</sup> He si od, The Shield of Herakles, lines 278 to 285.

<sup>2)</sup> Plato, Rep. III, 399. The English translation of Plato used throughout is Jowett's, Engl. Oxf. Ed. 1892.

<sup>3)</sup> Plutarch corroborates this statement, and adds that Clonas who lived many years after Terpander was the first to invent laws and airs for the aulos, though these were supposed to have been borrowed from the Mysians, De Musica 1133. — Pausanias (Corinthiaca lib. II 31, 3) ascribes the construction of the flute (aulos) to Ardalus, son of Vulcan. Athenaeus considers Marsyas the inventor of the aulos, but ascribes the anterior invention of the kalamos (reed) to Mercury.

that Marsyas challenged Apollo to a musical contest, in which the former played the aulos and the latter the kithara. Marsyas having failed in the contest was flayed alive, and his skin was made into a leathern bottle according to Plato 1).

This legend embodies one of the canons of Greek music and bears out the theory that the use of stringed instruments points to a higher grade of civilization in a nation than the use of wind instruments, a theory which found marked expression in the Greeks and was besides well understood by them.

If we turn to  $Leges^2$  we find an explanation of Plato's condemnation of the aulos and of all wind instruments quoted above:

The experienced see all this confusion and yet the poets go on and make still further havor by separating the rhythm and the figure of the dance from the melody, setting bare words to metre, and also separating the melody and the rhythm from the words, using the lyre or the aulos alone. For when there are no words, it is very difficult to recognize the meaning of the harmony and rhythm . . . And we must acknowledge that all this sort of thing which aims only at swiftness and smoothness and a brutish noise, and uses the aulos and the lyre not as mere accompaniments of the dance and song, is exceedingly coarse and tasteless. The use of either instrument when unaccompanied leads to every sort of irregularity and trickery.

In short Plato denounces virtuosity and absolute music as the heralds of the decadence of the art; however much we may agree with him as to virtuosity we cannot endorse the indictment against absolute music.

After one more quotation introducing the syrinx we must leave Plato for the present. In Symposium<sup>3</sup>) we find these words: »I say that he (Socrates) is exactly like the busts of Silenus which are set up in the statuaries' shops holding pan-pipes and flutes in their mouths, and they are made to open in the middle and have images of the gods inside them. I say also that he is like Marsyas the satyr. From the rest of the passage, which is too long to be quoted in extenso, we see that the comparison is explained thus; the words of Socrates, which he uses as Marsyas his flute, are divine and have power to possess the soul. this passage we gain the clue to the strange distinction accorded in Greece by writers and sculptors to the syrinx — a simple rustic pipe scarcely judged worthy of mention by other races — of being perpetuated on their monuments. The syrinx was of divine origin, it was regarded as the attribute of Pan or of Dionysus and his Satellites, and although as a musical instrument it was relegated to its proper pastoral sphere, yet it was honoured as a symbol.

<sup>1)</sup> Plato, Republic IV, 424.

<sup>2)</sup> Plato, Leges II, 669. 3) Plato, Symposium (Convivium) 215.

Before proceeding to trace points of interest in the development of the syrinx, it is necessary to consider — and in a chapter on »the pipe and the syrinx« this is legitimate — what words were used to designate different wind instruments of the flute and reed tribe in Greece, for this is an important factor in the unravelling of the tangle of possibilities and probabilities which too often constitute the greater part of our material for a history of musical instruments.

Avhòs is the word which is rendered »flute« in English and tibia in Latin, although the former is incorrect. The aulos was an instrument of wood, bone, metal, ivory, etc. with a conical bore and a mouth-piece containing a free reed 1); a fact noted by Engel and others, and observed in the instruments represented on the sculptures of ancient Greece. The instrument was in reality not a flute but an oboe or a clarinet (for both are found) and was held in the same position while playing. The name rapidly became a generic term for all instruments of that class, i. e. played with a reed, but as to whether or not the conical bore was a sine qua non, I have not yet satisfied myself. There were numerous varieties of this instrument known in Greece and named from some characteristic in their construction, tuning or origin; such are the monaulos and diaulos which explain themselves; the pythaulos was the kind of aulos which accompanied the ode<sup>2</sup>) called Pythikos πυθικός νόμος or πυθικόν αὐλημα<sup>3</sup>), celebrating the victory of Apollo over the Python. The Pythaules 4) (or player on the Pythaulos) when he sang the Pythian ode, had seven companions clad in the Pallium who sang to his accompaniment, whence he was later called the »choraules or chorus aulos player<sup>5</sup>)«: » Pythaules qui Pythia cantaverat, septem habuit palliatos qui voce cantaverunt, unde postea appellatus est Choraules.« As the Pythaules had to imitate the gnashing of teeth of the dragon, and his cries of pain when wounded, it must of necessity have been a reed instrument of powerful and penetrating quality, or perhaps the player carried more than one and changed from one to the other as need arose.

There were besides the distinctions of pitch, the ἀνδοήϊοι αὐλοὶ 6) which had a deeper pitch than the γυναικήτοι, these corresponding to the Latin dextra and sinistra?). There were also the distinctions of mode: the Lydian 8) [ $\Delta \dot{v}\delta \iota o \varsigma$ ], the Phrygian 9) [ $\Phi \varrho \dot{v} \gamma \iota o \varsigma$ ] and the Lybian 10) [ $\Delta \iota \beta v \varsigma$ ]; many others might no doubt be cited but these will suffice as examples.

<sup>1)</sup> Carl Engel, Musical Instruments (South Kensington Handbook No. 5), London 2) Hyginus (C. Julius), Fabulae 273, fl. AD 4. 3) Pollux, IV, 81.

<sup>4)</sup> Chappell, History of Music, p. 265, gives an interesting account of the Pythicos.

<sup>5)</sup> Quoted from Hyginus by Bartholinus, De Tibiis, p. 8. 6) Herod. I, 17.

<sup>7)</sup> Varro, Rerum Rusticarum 1, 2, 15, see Smith's Antiquities II, 30.

<sup>8)</sup> Pindar, Olympian Odes V, 45. 9) Sophocles, Fragmenta 398.

<sup>10)</sup> Euripides, Alcestis 347.

The pipes composing the syrinx in its primitive days had on the other hand nothing in common with the aulos; the former having stopped pipes in which air was blown in and out again at the same aperture, the latter was an open pipe, sounded by means of a reed mouthpiece, which gave it its penetrating tone. The simple reed primarily chosen for the purpose went by the name of  $\delta \acute{o} \nu \alpha \xi^{1}$  (or  $\delta o \acute{\nu} \nu \alpha \xi$  doric), the arundo dona<sup>2</sup>) of Linnaeus, and was sometimes used in the plural to designate the syrinx, as in Pindar's twelfth Pythic ode, where the additional information is given that the reeds grew near the  ${}^{\diamond}$ City of the Graces«, Orchomenes.

The passage has been very variously translated and seems to be somewhat obscure, but it appears to me to mean that the breath passed through the slender brass of the reeds (i. e. syrinx, in this case made of metal). I subjoin the Greek in case I am wrong:

Antistr. II, λεπτοῦ διανισσόμενον χαλκοῦ θ'ἄμα καὶ δονάκων, etc.« ³) In strophe I, Midas, the flute-player and winner at the Pythian games, is eulogized, he has conquered in the art invented by Pallas when she wove the fatal dirge of the bold Gorgons; here the word translated wove is διαπλέξαιο, which some commentators take as an allusion to the binding together of the reeds of the syrinx. M. Chabanon ¹) translates: »l' art que Pallas inventa, lorsque attachant ensemble des roseaux elle y fit passer les plaintes etc.«

Allowance must be made for the poet's licence and such a case is not without parallel. In Prometheus Chained 5) we find a similar example of an implied syrinx:  $\dot{\nu}\pi\dot{o}$   $\delta\dot{\epsilon}$   $\varkappa\eta\dot{\rho}\acute{o}\pi\lambda\alpha\sigma\upsilon o$   $\dot{\sigma}\upsilon\dot{\rho}\dot{\epsilon}\bar{\iota}$   $\delta\dot{o}\nu\alpha\xi$ » hoarse sounds the reed-compacted pipe a note sullen and drowsy» 6). In a note we read: »Stuck together with wax into the form of a pan-pipe. The sense is, according to Scholia Med., that the drowsy strains cannot soothe her who has no rest through hunger. We must suppose that the tones of the flute (syrinx?) were heard on the stage; and the spectral form of Argus must have been partially at least visible to the spectators.«

This passage is peculiarly interesting as indicating that for this once at least the syrinx was dragged from its modest pastoral home to figure upon the Athenian stage in its golden days.

In a passage from Theocritus we get four of the different kinds of

<sup>1)</sup> Homer, Il. X, 466; Od. XIV, 474; Hymn to Mercury, 47; Pindar, Pythic Ode XII, 44.
2) Plinius, XVI, 36, 66, and XVII, 20, 33.

<sup>3)</sup> Pindar, Pythic Ode XII, Antistrophe II, 1, 44.

<sup>4)</sup> Les Odes Pythiques de Pindare, traduction M. Chabanon, Paris 1772.

<sup>5)</sup> Aeschylus, Prometheus 574.

<sup>6)</sup> The Plays of Aeschylus, translated by R. Potter, Morley's Universal Library, Routledge 1886.

pipes together 1): »καὶ ἢν σύριγγι μελίσδ $\omega$ , κἢν αὐλ $\tilde{\omega}$  δονέ $\omega$ , κἢν δώνακι, κἢν πλαγιαύλ $\omega$ .« (Then I could sing sweetly to the syrinx, the aulos, the reed, and the oblique aulos.)

Some years ago I came upon a statement in some musical work, of which I have unfortunately lost the reference, which induced me to think that an early primitive organ was known in the days of Pindar at Agrigentum but not in Greece; the passage ran thus: »Pindar, in his 12<sup>th</sup> Pythic ode dedicated to Midas of Agrigentum, the successful candidate in the flute contest at one of the Pythian games, mentions a remarkable kind of syrinx, some of whose numerous pipes were reeds and some made of brass, an instrument of many voices, with voices of all kinds he calls it. He relates that this instrument having come to pieces, Midas turned it about and played on it as on a syrinx.

This puzzled me for some little time when I came to investigate the reference, as I make a rule of doing if possible, for nowhere in Pindar's Pythic odes could I find the syrinx mentioned; the spaced sentence we do indeed find in the ode, but the last and most important statement is not there. At last I came upon the source in one of the Greek Scholiasts<sup>2</sup>) (therefore not Pindar's words) on Midas, the Aulete. I cannot venture to give a translation, not knowing Greek, but it seems from the text that the instrument Midas was playing upon really came to pieces and that the mouthpiece of the flute, [the double-reed as it was an aulos] with which it was sounded, spontaneously gave forth music [which would be possible with a double-reed separated from the flute]; finally he played with the reed pipe alone [ $\kappa\alpha\lambda\acute{a}\mu\iota\iota\iota\varsigma$ ] in the manner of a syrinx, at which the people marvelled greatly, and so he gained the victory.

It is necessary here to say a few words about the Pythian Games and the musical contests. They formed one of Greece's four great national festivals, and were celebrated in the neighbourhood of Delphi, on the Crissaean plain, which contained a race-course, a stadium and a theatre, the latter for the musical contests.

The Pythian Games were according to legend instituted by Apollo himself<sup>3</sup>), and at first these sacred games consisted of musical contests alone, at which a hymn was sung to the Pythian god to the accompaniment of the kithara. After the Crissaean war in the  $48^{th}$  Olympiad the games were managed by the Amphictyons<sup>4</sup>). Pausanias, the historian, states that it was in this year that the contest included for the first time the  $\alpha \dot{\nu} \lambda \omega \delta i \alpha$ , an ode to the accompaniment of the aulos, in ad-

<sup>1)</sup> Theocritus, Idyll XX, 29. Poetae Bucolici et Didactici. C. Fr. Ameis, Parisiis 1846.

<sup>2)</sup> Pindari Carmina by C. G. Heyne, Oxford 1809, Scholia, p. 196.

<sup>3)</sup> Athenaeus, XV p. 701. 4) Pausanias, X, 7 § 4 et seq.

dition to the original  $\varkappa \iota \theta \alpha \varrho \omega \delta \iota \alpha$ . A subsequent innovation allowed instrumental contests on the kithara and aulos alone which were termed χιθαρίσται τ' αὐλήτας. One of the most important of all the contests was that of the nomos Pythikos (mentioned before) which, at a time not yet exactly determined by writers, consisted of five parts; these it is necessary for us to recall in order rightly to understand the scholia to Pindar; the five parts were:

- 1) the anacrusis 1) [ἀνάκρουσις] which one might term the overture,
- 2) the ampeira  $[\mathring{\alpha}\mu\pi\epsilon\iota\rho\alpha]$  or preparation and opening of the combat.
- 3) the cataceleusmos [xatanelevoµòs] or the combat itself.
- 4) the iambic and dactyl. [ἴαμβοι καὶ δάκτυλοι] or the acclamations of victory in two rhythms, one suitable for praise the other for insulting the foe.
- 5) the syringes  $[\sigma' \nu \rho \nu \gamma \epsilon \varsigma]$  celebrating the death of the monster by hissing<sup>2</sup>). The syrinx was a name for the hissing and whistling which amongst the ancient Greeks, as in our day, signified disapproval at public performances. The fifth and last part of the Pythicos therefore was an imitation of the dying hisses of the serpent monster.

We must not be induced for a moment to think that the syrinx or pan-pipe was ever used for this purpose in the Pythicos; at least not in the days of Pindar, nor is it by any means certain that these various parts of the Pythicos were in existence at that time. We are expressly told that this Ode of the Python was only for kitharistas and auletes 3).

For an explanation of the curious allusion to the syrinx in the scholia, we must refer to a passage in Plutarch's De Musica which immediately solves the riddle.

As an English translation was not available, I used the German by Westphal4) where we find:

»So war der Megarenser Telephanes den Syringen dergestalt abhold, daß er seinen Instrumenten-Machern niemals gestattete, dieselben auf die Auloi als Mundstück aufzusetzen, ja sogar hauptsächlich um der Syringen willen hat er sich vom Pythischen Agon fern ge- from the Pythian Games. halten 5). «

Thus Telephanes of Megarus was so incensed with the syrinx that he never allowed his instrument makers to place it upon the aulos as mouthpiece, he even went so far as to absent himself, on account of the Syrinx principally,

<sup>1)</sup> Strabo IX, p. 421.

<sup>2)</sup> Strabo IX, p. 421. — Liddell and Scott, Greek Lexicon, 8th Ed. »συριγέ«.

<sup>3)</sup> See for an account of the Pythic Games. Smith's Dictionary of Greek and Roman Antiquities, »Pythia« (ed. 1891).

<sup>4)</sup> Plutarch, Über die Musik. Von Rudolph Westphal, Breslau 1865.

<sup>5)</sup> Plutarch, De Musica, 1138.

This is a most interesting passage and had I known of it before, it would have saved me much labour. Greeks called the reed mouthpiece of the aulos the »syrinx«, which is quite legitimate since the word means first of all a reed; and therefore the scholiast was not romancing when he wrote that the aulos on which Midas was playing came to pieces and that the mouthpiece gave forth music — a double-reed of course will give a note without the pipe — and in order that there should be no interruption, Midas took up his pipe and used it without a mouthpiece in the manner of a syrinx, blowing into it with curved lips so as to send his breath with force against the sharp inner edge of the pipe, as the Egyptians did with their long-flute called ney. From Aristophanes (born at Athens B. C. 450) we learn that the syrinx was sometimes made of a larger kind of reed than the donax, namely the Kalamos »καλα-μίνην σύριγγα» 1) he calls it. This was a preparatory step to making other improvements in this pastoral instrument.

Music in Greece in the days of Aristophanes, Plato and Aristotle, was still revered as a sacred and sublime art, and those musical instruments which were used to accompany the voice were alone considered The performances of virtuosi more especially were condemned, because they pandered to the enjoyment alone of music without any regard for its moral effect. The number of strings had gradually increased on the kithara and lyre, and other instruments of many strings derived from other nations grew in favour because they afforded fresh possibilities for showing off the digital skill of the performer. The aulos shared in this feverish development and since it was not possible greatly to increase the compass of each aulos, these instruments were multiplied in number and kind. Even the syrinx which had long remained a pastoral instrument, taking no part in the serious tonal art, seems to have received attention in the cities and was in its turn exploited by virtuosi. use of the same word syrinx for the mouthpiece of the aulos and for the pan-pipe is apt to become puzzling, and it is sometimes difficult to distinguish between the two. There is however a passage in Aristoxenus which is interesting if it really refers, as I take it, to the pan-pipe: »And when the syrinx is drawn down [κατασπασθείσης] the highest tone of the syrinx-player forms with the lowest tone of the flute-player  $[\alpha \dot{\nu} \lambda \eta \tau \dot{\eta} \varsigma]$  a larger interval than the one mentioned.» 2) The translator Paul Marquard is of my opinion, and thinks that Aristoxenus here refers to some contrivance for enabling the performer to shorten the column of air in the pipes of the syrinx;

<sup>1)</sup> Aristophanis Fragmenta, F. H. M. Blaydes, Halis Saxonum 1885.

<sup>2)</sup> Aristoxenus, 21, 1) German translation by Paul Marquard, Berlin 1868, p. 28; 2) Commentary, p. 256.

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some sort of plug would be used to close the pipe which could be worked up and down. If the translation is accurate, and the words syrinxplayer and flute-player really occur in the Greek, then I cannot see that the sense of the passage can be explained otherwise. In his commentary, Marquard confesses that he cannot make much out of the passage and that he must wait for light to be thrown upon it. He cites a parallel passage in Plutarch which only makes the matter more unintelligible«, but which I think refers this time to the syrinx mouthpiece. I subjoin the Greek of Plutarch and the German of Marquard collated.

διὰ τί τῆς σύριγγος ἀνασπωμένης  $\varrho o \nu \dot{\eta} \chi \epsilon \tilde{\iota}^{1}$ ).

Warum wird, wenn man die Syrinx πᾶσιν ὀξύνεται τοῖς φθόγγοις, κλινομένης | heraufzieht, sie in allen Klängen erδὲ πάλιν βαρύνει καὶ συναχθεὶς πρὸς höht, wenn man sie aber beugt (?), erτὸν ἔτερον βαρύτερον διαχθείς δ'οξύτε- niedrigt, und klingt mit den anderen zusammengefügt tiefer, getrennt aber  $h\ddot{o}her?^2$ 

This query of Plutarch's I understand to refer to the tuning of the oboe (Aulos) by raising or lowering the reed mouthpiece, and that when the reed is sounded alone the tone is higher than when sounded in the pipe.

The commentator points out that this passage, although evidently referring to the same contrivance of which Aristoxenus speaks, implies that the effect is produced by the contrary process to that of Aristoxenus: i. e. in Plutarch ἀνασπωμένης and in Aristoxenus κατασπᾶν. In comparing this passage with one in Theophrastus 3) we find the expression xaraσπάσματα τὰς γλώττας ἴσχειν, which Sprengel translates: »Auch müssen die Zungen noch Schieber (Krücken) haben, um den schwingenden Teil der Zunge zu verlängern oder zu verkürzen4).« It seems from this that the single-reed mouthpiece of the clarionet must be the subject of Theophrastus's, perhaps also of Plutarch's, remarks.

Unfortunately, these descriptions or rather passing allusions are not very clear and without seeing a delineation of the instrument — which we do not possess — it is difficult to understand what this contrivance of Aristoxenus really was. It is not impossible that this syrinx may no longer have been the simple pan-pipe we know so well; it may have possessed other contrivances to which the writer does not allude, since his object is to define the pitch and to treat of harmony, not to describe

<sup>1)</sup> Plutarch, Non posse suaviter vivi XIII, 7 or Opera II, 1095.

<sup>2)</sup> Paul Marquard's Aristoxenus, Comment. p. 257.

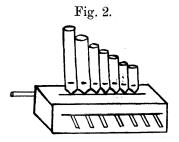
<sup>3)</sup> Theophrastus, Historia Plantarum IV, 11, 5. Greek and Lat. ed. Wimmer, Paris 1866.

<sup>4)</sup> German translation K. Sprengel, Naturgeschichte der Gewächse. Altona, 1822, p. 169.

musical instruments. We know that the wonderful hydraulic organ of Hero was still called by him a syrinx; was this only from a reminiscence in the arrangement of the pipes on the part of a mathematician who was not acquainted with the names of musical instruments? or was it that the syrinx kept its name through all the changes it underwent, until the application of water to compress the air caused the old name to be dropped for the more suggestive one of Hydraulos?

Of the Mashrokitha of the book of Daniel we have already spoken. Father Kircher (1601—1680 A.D.) in his Musurgia 1) gives a drawing of what he conceives to be the Mashrokitha or Magraketha of the Chaldees, a copy of which is reproduced in Fig. 2. This drawing must be accepted with a certain amount of reserve, for although it is possible of course that the good Father may have had access to MSS. now lost to us, yet his drawing is more probably a pure effort of imagination in order to illustrate the text.

We gather from his explanation that the Magraketha, from the whistling sound which it made, was named the instrument of many pipes; these are fastened together by a wooden support and arranged in order in the shape of a sheath. »Now the pipes are open above«, he continues, »but are closed in below by a skin enclosed in a sort of wooden chest and furnished with a tube by means of which it (the skin) is made to contract and expand. The



The magraketha from Kir-cher's Musurgia.

instrument is applied to the lips and when inflated, the air-holes at the side being opened or closed by means of the fingers, different sounds are obtained according to the length, width or shortness of the pipes, or even according to the extent of the inflation. Not the least curious part of this description is the concluding sentence: "Whence I conclude that this instrument was precisely the same as the syrinx or the Heptaulo Panis. It would seem as though Father Kircher had learnt from the classical writers that the syrinx possessed these new contrivances, that the Magraketha was in fact the syrinx of Aristoxenus further improved.

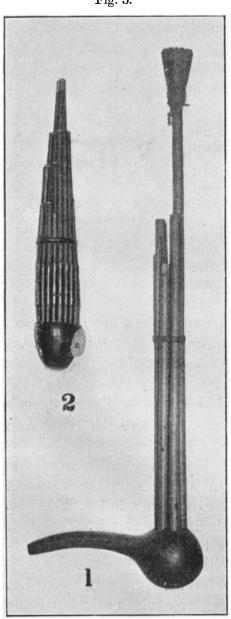
If the skin mentioned by Father Kircher as being inside the chest was really a fact, the description of his Magraketha is misplaced here, for it involves the use of bellows or of the bag-pipe applied to the syrinx, which anticipates the order I have followed in this article.

When we consider what this instrument involved, we must realize that a great advance had been made. In seeking for a new method of filling

<sup>1)</sup> Athanasius Kircher, Musurgia, Book II, Ch. IV, § 3, p. 3.

the pipes with air, they discovered the actuating principle of the open pipe. A box or windchest of a rectangular shape was constructed with a number of holes in the lid corresponding to the number of pipes desired; through another hole in the side of the box a reed enabled the player to fill the box with wind, and then all the pipes sounded at once unless the upper ends were covered by the fingers. As this method only allowed of using very small pipes, there soon followed other improvements. Thin slides of wood were contrived, passing under the holes in the lid

Fig. 3.



The Kronee (1) and the Cheng (2). From the Galpin Collection.

of the chest, with a perforation to correspond exactly to the size of the holes; the slides were manipulated from the outside by means of handles termed tongues or keys.

Instead of cutting off the reed immediately under the knot, a little piece was left which was shaped to a point to form a foot or mouthpiece, and this was placed over the hole in the box so as to split the stream of air in half as it issued from the hole. A narrow fissure was made in the knot or stopped end near the front or outer side of the pipe; a little higher up still in front, a horizontal slit was made in the reed, and the two edges were bevelled inwards. When the wind sent into the chest through the reed found an outlet through one of the holes in the lid, and the plate of air was split by the mouthpiece or foot of the pipe, it became compressed and was forced through the fissure in the knot; it then ascended the pipe in a steady column until it met another obstacle, the upper sharp edge of the notch which produced the rapid flutterings or vibrations necessary for the emission of a note. If the force of the vibrations at the notch be equal to that of the air entering at the upper end of the pipe, the two currents will meet exactly half-way between the two, neutralizing each other and forming a place of rest called a node (corresponding to nodes in a vibrating string); these conditions produce the fundamental tone or lowest note. Suppose, however, that the pressure of air be increased at the embouchure of the pipe, the meeting of the currents will then take place at one fourth of the whole length of the pipe from the embouchure, forming a node there and another at one fourth from the other end. This will produce the first harmonic, the 8<sup>ve</sup> of the fundamental, and so on in proper proportion for the succeeding harmonics. It is exceedingly doubtful that the ancients thoroughly understood the question of harmonics at the time at which this Mashrokitha was first constructed.

The Cheng of which an illustration appears with these lines by the courtesy of the Rev. F. W. Galpin, belongs to his collection of musical instruments, which is a very fine one, notable for the completeness of the various groups of stringed, wind and keyboard instruments, and for the fact that with few exceptions the instruments are kept in playing condition. The second instrument, the Kronee of North Borneo, is like the Cheng a free-reed primitive organ. The tone of these instruments is reedy and sweet, having none of the harsh penetrating quality of the The Cheng or Tscheng is an instrument which is equivalent to the Magraketha of Kircher, an improved Siao in fact. It consists of a box or calabash hollowed out to form the windchest and having a tube like a spout let into the side. In the windchest are arranged in a circle 13, 19 or 24 tubes or bamboos of various lengths, all open pipes, each with a foot containing a little loose leathern tongue to produce the necessary vibrations, for in the Cheng, the notches with bevelled edges are replaced by a round ventage hole stopped by one of the fingers. this leather tongue we have the actuating principle of the harmonium and reed organ.

The name of the instrument which is said to be very ancient was Yu. European travellers describe musical instruments on Buddhist-temples of Ongcor-Wat and Ongcor-Thôm in Cambodia which are supposed to be above 2000 years old. On the bas-reliefs are, according to these travellers, (of whose identity Mr. Carl Engel gives us no clue) flutes, organs, trumpets and drums resembling those of the Chinese 1).

Pandean-pipes continued in favour with the rustic populations of the West long after the organ evolved from them had eclipsed its humble prototype by the magnificence of its tone and the ingenious complexity of its mechanism. The syrinx was in fact commonly in use during the middle ages when in France it was known for a season (circa 14<sup>th</sup> cent.) by the name of *frestéle* or *frêtiau*.

<sup>1)</sup> Carl Engel, Musical Instruments (S. Kensington Handbook, No. 5) p. 46.

At the beginning of this century there was a revival of the popularity of the instrument and quartets were played on four sets of pipes differently pitched. The familiar mouth-organ, the delight of the children, is the representative of the syrinx at the present day. We are however only concerned with the syrinx in so far as it was a predecessor of the organ. During its evolution the syrinx entirely lost its earliest characteristic of closed pipes, and the open pipe of the aulos was substituted, together with a mouthpiece.

## Part III. The Bellows and the Bag-pipe.

So far we have considered the forerunners of the organ whose pipes are sounded by means of the human breath, a method of inflating which necessarily very much limited the performance for obvious reasons. Suppose Father Kircher's Magraketha to have really existed, it would probably have struck some ingenious musician, who was tired of blowing into the little feeding pipe at the side, to attach the bellows to it and save his lungs. This forms the next stage in the development of the organ and we are indebted to the bag-pipe for the idea; in fact the principles of the syrinx and the bag-pipe form the essential basis on which the organ grew up little by little and we must therefore bestow some little attention upon this ancient instrument.

The history of the antecedents of the bag-pipe is more or less veiled in the obscurity of ages; in musical histories and dictionaries we generally find the statement that it was in Greek called askaules from  $\alpha \sigma n \delta s$  a bag, and  $\alpha \dot{\nu} \lambda \dot{\sigma} \dot{\sigma}$  a pipe; in common with many others, no doubt, I pinned my faith on this statement until I began my researches into the origin of the organ. I was then amazed to find how slender a foundation there was The only reference given by Liddell & Scott in for this statement. the Greek Lexicon is, v. Reisk ad Dio Chrysostomos, 381, where I found the following unmistakable description 1). »And they say that he is skilled to write, to work as an artist and to play (the pipe =  $\alpha \dot{v} \lambda \epsilon i \nu$ ) with his mouth on the bag  $(\alpha \sigma \kappa \sigma s)$  placed under his arm-pits«. The word askaules is not there however, except by inference. The date at which Dio Chrysostom flourished is 100 A.D.; it will therefore scarcely be accurate to state without qualification that the bag-pipe was known to the Greeks by the name of askaules. In Martial (A. D. 104fl:) we find another reference to askaules 2) which for completeness' sake I will quote:

Credis hoc, Prisce,

Voce ut loquantur psittacus coturnicis. Et concupiscat esse Canus ascaules?

<sup>1)</sup> Dion Chrysostomi editio Adolphi Emperii; Brunswick 1844, p. 728 or LXXI (R) 381. 2) Martial, X, 3, 8 and III, 4.

To which is appended the note: Canus Nobilissimus tibicen quo Lib. IV, 5. Ascaules autem dicitur utricularius seu qui utrem inflat, quem imitari nolit Canus.

Should not the bag-pipe be askaulos and the piper askaules? Canus was one of the much fêted virtuosi of decadent Rome. Others may have found references to this word in the older classics, I have not; although I have searched for it in many lexicons and indices to individual works.

Are we to think then that the instrument was unknown to the ancient Greeks? That is a question that will be answered as we proceed with our investigations.

Some theologians and writers on music maintain that the Greeks called the bag-pipe the symphonia, and they give as their authority the verses in Chapter III of the Book of Daniel, which contain the well-known enumeration of the musical instruments used to give the signal for the worship of the golden image of Nebuchadnezzar set up in the plain of Dura. The names of these musical instruments, the keren, mashrokitha, kaithros, sebeka, pesantir, siponya, have been made the basis of a theological controversy which has broken out again and again as to the authenticity of the book of Daniel, whose divine inspiration is now attacked by the rationalists; they and the »higher critics« maintain that three at least of these instruments bear Greek names: kaithros = kithara; pisantir = psalterion; siponya = symphonia; these are at any rate the names given in the Septuagint; this together with a few other contested words, of which according to Lenormant but one remains to which one could possibly assign a Greek origin, is considered sufficient to indicate that the book was written after the conquest of Palestine by Alexander the Great (B. C. 332). The rationalists even go so far as to place the authorship as late as the reign of Antiochus Epiphanes, [B. C. cir. 187], in whom some of the prophecies were fulfilled, in order to account for the latter as passed events. In this case the date of the Greek version of the Bible known as the Septuagint [B. C. 285 to 247] would have to be shifted some 150 years at least nearer the Christian Era, else the translation would antedate the original. For authorities in favour of the genuineness of Daniel see Pusey, Hävernick, Keil, Kliefoth, Seiss, and against it Eichhorn, Hitzig, Driver, De Wette, Gensenius etc. The Rev. S. R. Driver in his Introduction to the Literature of the Old Testament even goes so far as to say'): "The Greek words demand, the Hebrew supports, and the Aramaic permits, a date after the conquest of Palestine by Alexander the Great«.

The subject lies beyond the scope of this article except inasmuch as it may throw a light on the history of the bag-pipe.

<sup>1)</sup> S. R. Driver, Introduction to the Literature of Old Testament, 1897, p. 508.

The crucial questions seem to be these:

- 1) Were the contested instruments, the kaithros, pesantir, and siponya, known in Assyria, and if so at what date?
- 2) Were they known in Greece and at what date?
- 3) Supposing the names independently of the instruments to have a Greek origin, is there any unimpeachable explanation to be offered as to the manner in which they reached Assyria and if so at what date?

There is absolutely nothing in the history of the instruments themselves that can stand against the authenticity of the Book of Daniel, for with the exception of the siponya [there are strong reasons to believe this was a bag-pipe] which is not found on the monuments of any country, the musical instruments mentioned are all found on Assyrian bas-reliefs of the 5<sup>th</sup> century B. C.

Greece cannot lay claim to the invention of either kithara or psalterion, for both are found on the monuments of Egypt and Assyria at a date, in the case of the kithara, 1700 B. C., when as yet Greece possessed no historical record, and the psalterion in the 8<sup>th</sup> century B. C. in Assyria; whereas in Greece the name as an instrument is not recorded before the 4<sup>th</sup> century B. C. 1). The word psalterion is derived from psallo, to pluck, pull, and it was applied in the 6<sup>th</sup> century B. C. to the hair 2), in the 5<sup>th</sup> century B. C. to the bow 3), and in the 4<sup>th</sup> B. C. to musical instruments 4).

As to the symphonia, I do not consider that the word was ever used to denote a single instrument, and certainly not a bag-pipe.

In the Polyglot Bible<sup>5</sup>) the word symphonia is left out in the Greek text of the Septuagint, although given in the Vulgate and the Hebrew; and it only appears in an annotation headed MS. A [which means either the Alexandrine or the Ambrosian MS.]  $(\eta)$   $\sigma v \mu \varphi \omega v i \alpha g \ll 1$ . It is evident that the reverend translators were not a little puzzled by the names of the musical instruments, for, as an instance, they render ugab in Genesis psalterion; nebel in the Psalms etc. as a psalterion; the pesantir of Daniel as psalterion, and the toph (Job. 21, 12) finally also psalterion; actually two stringed, one wind and one percussion instrument all rendered by the same name; this speaks for itself and must shake our faith in the Septuagint as to musical matters. The Greek word symphonia is very old and is found in many of the classics. In Homer<sup>6</sup>), for instance,

<sup>1)</sup> See Liddell and Scott, Greek Lexicon. — Aristoteles, Problemata XIX, 23, 2. 2) Aeschylus, Persai 1062. 3) Euripides, Bacchae 784.

<sup>4)</sup> Plato, Lysis 209 B.

<sup>5)</sup> Biblia Sacra Polyglotta, Wallon, London 1656, the Greek Septuagint compiled from ancient versions.
6) Homer, Hymn to Mercury, 51.

the adjective  $\sigma \acute{\nu}\mu \varphi \omega \nu o g$  formed from it is used with the meaning of consonant, harmonious; most writers indeed used the name  $\sigma \nu \mu \varphi \omega \nu i \alpha$  as a concert of voices, or simply as "harmony". I feel tempted to quote Plato on the subject for his definitions are so striking!): "In the harmony of song which is termed  $concord(\sigma \nu \mu \varphi \omega \nu i \alpha)$ " and again: "For harmony is a symphony and symphony is an agreement" ( $\acute{\alpha}\varrho \mu o \nu i \alpha \sigma \nu \mu \varphi \omega \nu i \alpha \acute{\delta} \sigma \nu \iota \sigma \nu \mu \varphi \omega \nu i \alpha \acute{\delta} \delta \mu o \lambda o \gamma i \alpha \tau \iota \varsigma^2$ ).

There are but few, very few cases in the classics, in fact, where the word could possibly refer to a single instrument, and the strongest arguments are against the hypothesis. Polybius, the historian [born cir. 204 B. C.] in his description of the court of Antiochus Epiphanes says<sup>3</sup>): » Quodsi quos forte juvenes tempestuum celebrare convivium censerat statim cum tibia et symphonia (μετὰ κερατίου καὶ συμφωνίας) aut commessationem accedat«. This keration, rendered tibia, was perhaps a small horn or an aulos tipped with horn, in any case an Asiatic instrument probably, and the symphonia was a band of singers or of flute-players performing in parts on flutes of different pitch; this opinion is based on the word symphoniaci, a term applied by various authors 4) to specially trained bands of slaves kept by rich men to provide music at banquets, a custom said by Livy<sup>5</sup>) to have been imported from Asia about 187 Further we gather from the Digesta 6) that the music of the symphoniaci was concerted, and that to such a degree, that if one of the party was absent, it rendered the rest useless?).

These writers all lived later then Polybius and their writings are posterior to the introduction of the custom from Asia [which coïncides with the date at which Polybius describes the use of symphonia at the court of Antiochus]; but the further back we place the supposed use of symphonia as a musical instrument like the bag-pipe, the more absurd the hypothesis becomes.

Thus we see that there is nothing in the history of the kithara, the psalterion, and the symphonia, to demand a later authorship of the book of Daniel.

Supposing the disputed instruments to indeed bear Greek names, it is far more reasonable to place their introduction into Assyria before the date of Nebuchadnezzar (cir. 580 B. C.) than after. We know that commercial intercourse existed between parts of Greece and Assyria

<sup>1)</sup> Plato, Cratylus, 405 D (Jowett's English translation).

<sup>2)</sup> Plato, Symposium 187 (B). 3) Polybius XXVI, 10; 5; and XXXI, 4, 8.

<sup>4)</sup> Cicero, Pro Milone XXI, 55; In Verrem 5, XXV 64; cf. Macrobius, Saturnalia, lib. II cap. IV, 28.

<sup>5)</sup> Livius, XXXI, 6. 6) Digesta IX, 2, 22, 1.

<sup>7)</sup> See Smith's Dictionary of Greek and Roman Antiquities Art. Symphonia.

during the VIIIth and VIIIth centuries B. C.1), we know that it was the custom of the kings of Assur to carry away captive musicians and to require of them music: »By the rivers of Babylon . . . . there they that carried us away captive and required of us a song<sup>2</sup>)«. Among the many corroborations from profane history, I select the following: »Sapibel its strong city . . . . I captured, the Dunanu and his brothers from the midst of that city alive I brought out. His wife, his sons . . . . male musicians and female musicians I brought out, and as spoil I counted . . . . the musical instruments of his palace 3).« It is evident that the kings of Assur delighted in music and were glad to hear foreign music and to become acquainted with foreign musical instruments. Assurbanipal from whose cylinders the above is quoted reigned from B. C. 668 for 42 years 4). Possibly some of the musicians on the plain of Dura were strangers. Assurbanipal enumerates among his tributaries several Greek kings The brother of the poet Alcaeus 6) during the reign of of Cyprus 5). Nebuchadnezzar had won fame at the uttermost ends of the earth by helping the Babylonians (in war).«

The instruments moreover themselves, if Greek, point to a date before the decadence of the art in Greece — which was well advanced before the days of Alexander the Great. This must suffice on this subject and those who wish to pursue the subject further could not do better than study Lenormant and J. Vigouroux 7), and the translations of the cuneiforms.

It is a curious coïncidence that the bag-pipe was known in Italy, France, and Spain, during the middle ages by the name of Zampogna, or Sampogna, which strongly recalls the Chaldee sumponya, and that in those countries the word sinfonia should exist side by side with Zampogna and with the same meaning which Plato attached to it centuries before i.e.: a concord of sounds. Is it not strange that the word for bag-pipe should resemble the Chaldee word rather than the Greek? and that the Greek word should have retained its original meaning from the days of Homer?

Having failed to trace the bag-pipe in Greece under the name of

<sup>1)</sup> See Lenormant (F), La divination chez les Chaldéens, p. 174 note 2.

<sup>2)</sup> Ps. 137, v. 3.

<sup>3)</sup> See George Smith, History of Assurbanipal from the cuneiforms, London 1871, p. 131/132. 4) Ibid. Chronological Remarks, p. 356.

<sup>5)</sup> Lenormant, La divination chez les Chaldéens (which forms part II of Les sciences occultes de l'Asie, Paris, 1875) p. 174, note.

<sup>6)</sup> Alcaeus of Mytilene (fl. 611 BC). Smlith, Dictionary of Greek and Roman Biography, gives instances of his brothers as soldiers (vol. I, p. 95), London, 1844.

<sup>7)</sup> J. Vigouroux, La Bible et les découvertes modernes, Tome IV, p. 419: La musique babylonienne.

symphonia, we must turn to the Chaldee text of the book of Daniel. As in the manuscript Hebrew Scriptures of the Kethib only the consonants were written down, with certain indications for the guidance of the reader, the vowels sounds being added from memory as handed down by tradition, it is difficult to ascertain what the exact form of the original words was. The Kari, or directions for reading the Kethib with the vowels, was added some centuries after Christ, hence we find in the text siponia and in the margin you are directed to read sumponya; these directions, I have been told by an oriental scholar, were often an attempt to fix the etymology of doubtful words and this may have happened in the case of sumponya.

Several attempts have been made to give a derivation of the word from the Chaldee, but even the writers themselves do not seem wholly satisfied with them. I have selected two: Mayer and Hävernick suggest the Hebrew stem sup (the \*p\* bring sounded \*f\*) meaning a reed, and Meier suggests sap sounded (saf) = a cover, with a reference to the colloquial Arabic tsofno or tsofano a leathern vessel for washing or for drawing water<sup>1</sup>). Either of these etymologies would be sufficient to justify our looking upon the sumponya as a bag-pipe.

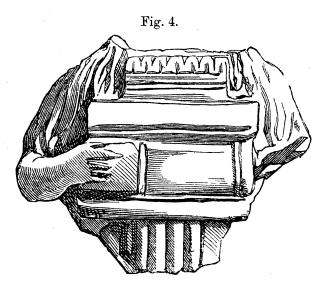
Regarding the history of the bag-pipe itself, we find that the ancient Egyptians several thousands of years ago were acquainted with the principle of the bag-pipe drone. This fact has been revealed by the straws or beating reeds found within pipes which had been enclosed within mummy cases; there is one at the British Museum with the reed tongue inside, and at Turin, in the Museum of Egyptian Antiquities 2), there is a pipe 23<sup>3</sup>/<sub>8</sub> inches long with three holes; inside is a short piece of straw which has been partly cut through to about 1/4 of the diameter, the blade of the knife being then turned flat and passed upward, thus raising a strip which served as a beating reed. The Turin pipe will not sound unless the straw is sunk about 3 inches within the pipe, which is the principle on which the drones are constructed, \*the pipe moreover could not have been played at any time by the lips direct upon the straw<sup>3</sup>)«. Of the actual bag-pipe we have no trace among the many musical scenes painted or carved on the tombs and monuments of Egypt; this is no proof that the instrument was not in use among the pastoral tribes, for the music of the Egyptians like that of the Greeks, judging from the number and perfection of their stringed instruments, must have been of an advanced type; it was interwoven very closely

<sup>1)</sup> See Pusey, Daniel the Prophet, London 1869, p. 30 (note).

<sup>2)</sup> Sir Gardner Wilkinson, Manners and Customs of the Ancient Egyptians, vol. I, p. 487. 3) Ibid.

with their civil and religious life. One cannot conceive the harsh drones of the bag-pipe mingling with the delicate sounds of harps, guitars and flutes.

It is significant that the accompanying illustration, the oldest extant at present of the bag-pipe — if indeed it can be so termed for it seems



Instrument connecting the pan-pipe with the organ From Tarsus in Cilicia (W. B. Barker, Lares and Penates, p. 260).

to be an instrument partaking of the nature of both bag-pipe and syrinx should have been unearthed in Asia Minor, at Tarsus in Cilicia; some coins found buried with it warrant the date of the pottery to be 200 B. C. (circa). This locality was well within the sphere of Greek, Hebrew and Assyrian influence. The fragment was discovered together with many others by Mr. W. Burckhardt Barker, who has given the drawing 1) together with the following description 2):

There is also a fragment of the middle portion of another figure playing upon a reed instrument of a more perfect form than the syrinx (see fig. 1) ... The instrument consists of a vertical row of pipes, the length unknown as the lower portion is wanting; they are inserted into a small air-chest, which appears inflated in the middle part. The right hand is operating upon it with a kind of cushion or compress (the bellows, K. S.) by which he forces the air into the pipes, and which he seems to apply to different portions at will« (in this statement, Mr. Barker seems to be drawing somewhat upon his imagination, as also in the next. K. S.). »There appears to have been a prolongation of the central part across the left arm; the loss of this is much to be lamented; as this would have shown us more of its construction and also how the left hand was employed in playing it. It is firmly fixed to the body; but the upper ends of the reeds are too low for the performer to blow into them with his mouth. The openings in the tops of the reeds are all perfect; nothing is deficient at that end.«

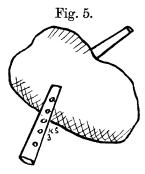
This account makes one long to get a sight of the pottery itself, for if the openings in the tops of the reeds into which the performer blew,

<sup>1)</sup> The drawing was photographed for this article to ensure absolute accuracy.

<sup>2)</sup> W. Burckhardt Barker, Lares and Penates, London 1853, p. 260, fig. 69.

are all perfect, the drawing must be faulty, for in it they are made to appear like an ornamental moulding. The Rev. F. W. Galpin with whom I was discussing the illustration, suggested, in order to account for the shortness of the reeds, that this might be an early reed-organ of a primitive nature.

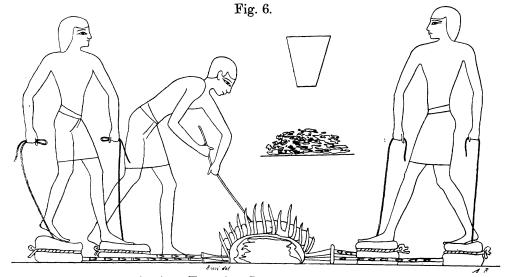
With regard to the lower pipes if they really existed, we must wonder whether they were drones or bass-pipes, and if so what contrivances were provided for enabling individual pipes to sound alone.



A primitive bag-pipe.

Unfortunately I do not know the present whereabouts of the sculpture, or I should have made an effort to see it. This illustration is given here out of its place in order to establish the fact that the bag-pipe was a familiar instrument in Asia some centuries probably before its active principle was thus applied to improve the syrinx, two or three examples of which were found by Mr. Barker near Tarsus (see fig. 1).

The bag-pipe was no doubt the outcome in the first instance of a desire to increase the wind supply of the pipes, and as such it presents undeniable affinities with the simple bellows. Primitive bag-pipes like the one illustrated, see Fig. 5, consisted merely of a leather bag or skin into which were fastened two pipes, one for inflating purposes and the second pierced with lateral holes to be stopped by the fingers, and on which the melody was played; the bag was compressed by the arm under which it was held as described by Dio Chrysostom. The use of bellows single and in pairs in forges was known in Egypt before 1500 B. C., as the accompanying illustration, see Fig. 61, testifies.



Ancient Egyptian Bellows (1500 B. C.).

<sup>1)</sup> From Champollion, Monuments de l'Egypte et de la Nubie, Paris, 1835—1842, Vol. II, pl. 165, which was photographed in order to ensure an accurate illustration.

The bellows, we read in Champollion, were used for: \*la fonte des métaux (par le feu); deux soufflets sont alternativement manœuvrés au moyen d'une corde « and the drawing was made after a pair represented on the tombs at Kourna. At that time bellows consisted merely of bags of skin bound round with thongs and having a very long pipe outlet. Bellows of a very similar model brought from Kaffirland may be seen in the Anthropological Section at the British Museum. The bellows were compressed in turn by the blower who threw his weight first on one foot and then on the other, executing a rhythmic step and holding in each hand the cord, with which he also alternately raised the bags or bellows, and allowed them to refill with air as soon as the pressure of his foot was removed. This action is clearly visible in the blower to the left of the drawing.

When the bag-pipe was known in Egypt and when it received the addition of a drone, it would be hard to state, for drone pipes may have been used independently to form a bass accompaniment to concerted music; and unless fresh discoveries are brought to light during the excavations at present being carried out in Egypt, the questions do not seem likely to receive any solution. In the absence of documents to prove the existence of the bag-pipe in Asia in remote times, we must turn to Greece who derived so many of her instruments from Asia and brought them to great perfection.

The bellows  $(\varphi \tilde{v} \sigma \alpha)$  were in use in Homer's day, and in the Iliad¹) there is a vivid description of Vulcan's forge and bellows; it seems as though the latter were of the same kind as the Egyptian; we read that when Thetis entered²) she found the lame god flying from fire to fire blowing the roaring bellows, and when he laid aside his work to offer hospitality to his fair visitor, we hear that he lifted or drew the bellows away from the fire: »Folles quidem seposuit ab igne«³); and again, when he returned to his work: »Abiitque ad folles; — illos autem recta contra ignem vertit iussitque operari«⁴).

Having found the various words used for bellows in Greek, the next thing was to search for derivatives (those of askos having afforded little that was of use), and I was rewarded by coming upon an instrument I have not seen mentioned by any writer on music, i. e. the *physateria* or *physallis* [ $\varphi v \sigma \alpha \tau \eta \varrho \iota \alpha$  from  $\varphi v \sigma \alpha \tau \eta \varrho \iota o \nu$  Doric for  $\varphi v \sigma \eta \tau \eta \varrho \iota o \nu$  in the nominative plural, a wind instrument, and  $\varphi v \sigma \alpha \lambda(\lambda) \ell_S$ ,  $\ell \delta o s$ , a wind instrument] the words occur apparently only this once in the musical sense and that in the play of Lysistrata by Aristophanes [born 450 B. C.] in which

<sup>1)</sup> Homer, Ilias, Graeci Polyglotta, Florentiae 1837, lib. XVIII from v. 368 to 470.

<sup>2)</sup> Ibid, v. 372. 3) Ibid, v. 412. 4) Ibid, v. 468.

<sup>5)</sup> Liddell and Scott, Greek Lexicon.

he illustrates the evils of the Peloponnesian War. Lysistrata, wife of one of the first magistrates of Athens, prevails on the married women of Athens and Sparta to separate from their husbands until peace should be concluded. The ambassadors who have met in conference are feasting, and as they come forth the following dialogue takes place among those of the citizens standing outside:

Laco: >- O, dearest, take your Physateria 1) and blow that I may dance and sing joyously about the Athenians and ourselves at the same time. <

Athen: »— Ay! then take the Physallis<sup>2</sup>), I beseech you, for nothing delights me more than to see you dance.«

Hesychius remarks about the Physallis:  $\varphi v \sigma \alpha \lambda \lambda i \delta \epsilon \varsigma$ :  $\varphi v \sigma \eta \tau \dot{\eta} \varrho \iota \alpha$ ,  $\alpha \dot{v} \lambda \delta i$ , and gives a reference to Lucianus<sup>3</sup>) to whose words  $\tau \dot{\alpha} \varsigma$   $\varphi v \sigma \alpha - \lambda i \delta \alpha \varsigma$  we find the following note: \*bullas istas inquam inflatas unde cogitur spuma\*. Herodotus in giving an account of the strange manner in which the Scythians milked the mares says 4): \* $\varphi v \sigma \eta \tau \ddot{\eta} \varrho \alpha \varsigma - \dot{\delta} \sigma \tau \epsilon i v v \varsigma$   $\alpha \dot{i} \lambda \delta i \sigma \iota \pi \varrho \sigma \varepsilon \mu \varphi \varepsilon \varrho \varepsilon \sigma \tau \dot{\alpha} \tau v v \varsigma$ ; fistulas sumunt osseas tibiis simillimas\* in conjunction with which in addition comes the verb  $\varphi v \sigma \dot{\varepsilon} v v \sigma \iota =$  blew or inflated.

The verb  $\varphi v \sigma \acute{a} \omega$  to blow, besides being the proper word to denote blowing the bellows, is sometimes used with reference to the aulos instead of the kindred verb  $\alpha \mathring{v} \lambda \acute{e} \omega$ ; whether this has any special signification I know not, but what is more important, I have found it used in Byzantine times (Porphyry, VII) with the word organ to denote the pneumatic as opposed to the hydraulic:  $*Sclavos\ quoque\ organa\ inflaturos\ [v\grave{\alpha}\ \mathring{v}\varrho\gamma\alpha\nu\alpha\ \varphi v\sigma \mathring{v}\nu\alpha\varsigma]\ ibi\ stare\ non\ sinat^{5}$ .

It seems beyond a doubt that in Lysistrata (l. c.) Aristophanes is speaking of some kind of bag-pipe, whether of the instrument proper with bag compressed by the arm or of the curious instrument so often mentioned in the middle ages under the name of Chorus 6), the forerunner of the platerspiel 7), consisting of a bladder enclosed in a sphere of metal with two pipes fastened to it; one short one acting as mouthpiece and inflator and the other with finger-holes for playing the melody. The bladder when violently inflated vibrated against the metal case, producing

<sup>1)</sup> Aristophanes, Lys. 1242.

<sup>2)</sup> Ibid., 1245. 3) Lucianus (fl. 160 (?) A. D.), Contemplantes XII, 19.

<sup>4)</sup> Herodotus, IV, 2 (born 484 B.C.).

<sup>5)</sup> De ceremoniis aulae Byzantinae Lib. I, cap. LXXII, p. 211.

<sup>6)</sup> See S. Hieronymi Opera, tom. V. p. 191, Epistola ad Dardanum, and for the description quoted, Viollet-le-Duc, Dict. du Mobilier français, Tom. II, p. 250, or Gerbert, De Cantu, Tom. II, p. 150.

<sup>7)</sup> A suggestion I owe to the Rev. F. W. Galpin.

a curious quality of tone: \*\*Chorus quoque simplex, pellis cum duabus cicutis aereis et per primam inspiratur, per secundam vocem emittit.\*\*

On searching in the same manner for the Greek equivalents of drone and their derivatives I was a second time rewarded by finding the curious compound Bombaulios [βομβαύλιος], again used by Aristophanes in his play "the Acharnians". The word is derived from  $\beta o \mu \beta \dot{\epsilon} \omega - \alpha \dot{v} \lambda \dot{\delta} \varsigma$ , a comic compound for askaules, a bag-piper, with a play on  $\beta o \mu \beta \nu \lambda \iota \dot{o} \varsigma$ , an insect that hums or buzzes<sup>2</sup>). It is probably from this name given to the instrument or at least from a similar derivation that we get the curious and puzzling description of the Bombulum of S. Jerome which has been pictured in various fanciful ways by writers of the middle ages. The Acharnians« was a play brought out at the Lenaea, the festival of Dionysus, in the month of Gamelion B. C. 425. It gained the first prize. The play runs, like Lysistrata, on the evils of the Peloponnesian War. Aristophanes was a bold and often a wise patriot. He had the strongest affection for Athens and longed to see her restored to the state in which she was flourishing in the previous generation. It was with this end always kept in view that he wrote his plays.3)

In the scene from which our quotation is taken, a Bœotian enters, followed by a slave Ismenias, with a load of vegetables, fish, flesh and fowl. A band of Theban pipers plays him into town. He is willing to do a little trade but Discaepolis takes the best eel as toll for the market, then offers him sardines and earthen-ware which the Bœotian declines, as he has plenty of these at home.<sup>4</sup>)

Boot. Do you put down the penny-royal gently, Ismenias, and do you all you flute-players  $(\alpha \dot{v} \lambda \eta \tau \alpha \dot{t})$  who are here from Thebes blow  $[\varphi v \sigma \tilde{\eta} \tau \varepsilon]$  the dog's tail with your bone-pipes.

Dic. Stop! and go to the crows! You wasps, won't you get away from the doors? Whence have the bumblebee pipers [l, 865], [ $\beta o\mu$ - $\beta a \dot{\nu} \lambda \iota o \nu$ ] cubs of Chaeris flown to my door, the accursed wretches?

Bœot. Yea, by Iolaus and welcome stranger! For blowing  $[\varphi v - \sigma \acute{\alpha} \nu \tau \varepsilon \varsigma]$  all the way from Thebes behind me they have knocked off the penny-royal on the ground etc.

In Blaydes' edition of Aristophanes the commentary to line 865 reads: »Anglice« droners on the bag-pipe«. There are one or two points in this passage which call for notice: first the use of the verb  $\varphi v \sigma \acute{a} \omega$  with the bone-pipe played by the auletai, and again further on »blowing all the way from Thebes«  $[\varphi v \sigma \acute{a} v \tau \epsilon \varsigma]$  where it stands for the piping of the bag-pipers; if the instruments had been ordinary auloi the verb

<sup>1)</sup> Aristophanes, Acham. 866. 2) Liddell and Scott, Greek Lexicon.

<sup>3)</sup> Smith's Biogr. Class. Dict. »Aristophanes«.

<sup>4)</sup> Aristophanes, Acharn., Oxford Transl. of the Classics 1898, p. 42 l. 860 to 868.

 $\alpha \dot{\nu} \lambda \dot{\epsilon} \omega$  would have been used; secondly it is a curious fact that the Bœotians were noted for their bone auloi made from the thigh bone of some animal [as in Ancient Egypt the flute sebi-en-rat]<sup>1</sup>). It is as well to recall at this juncture that the aulos was a general term for all pipes sounded with a reed mouthpiece, and that the bag-pipe belonged to this class, hence its rational name in later Greek askaules and the occasional use of the verbs and adjectives formed from aulos in connection with it. The Bœotian calls the pipers  $\alpha \dot{\nu} \lambda \eta \tau \alpha i$ , for instance, it is only Dicaepolis in satire who calls them Bombaulion.

The Language of Aristophanes, says Lemprière, is elegant in the last degree, a specimen of the purest Attic; he employs it with the greatest dexterity in all its shades of difference, from dialogue to dithyrambic songs... He expected from his audience considerable skill in poetry and more especially they must retain almost word for word the master-pieces of the tragic writers to understand his parodies. And what presence of mind was necessary to catch in passing that light and hidden irony, those unexpected sallies, strange allusions, frequently indicated by the mere turn of a syllable. \*2)

The passage in which the bag-pipe is mentioned is just one of these flights of irony. Aristophanes was an Athenian of the Athenians who looked down on the intellect, the literature, and arts, of the other cities. One must not think that the introduction of the Beetian pipers was accidental or a piece of local colour. It is possible of course that the Theban citizens occasionally marched from place to place to the sound of the bag-pipe; but it is unlikely, for they were renowned for their musical taste and abilities, and here they cut but a poor figure, those »bumble-bee pipers«, as the representatives of musicianly Bœotia; the ultra-refined taste of the Greece of Aristophanes' day would not have been so much outraged had the pipers been a band of shepherds or rustics, but the sting lay in making them Thebans — from the chief town of Beotia itself. We cannot but admire the consummate skill of the satirist in choosing the bag-pipe of all instruments; he showed that he was intimately acquainted with the musical history of Beetia by emphasizing the bone pipes, which their remote ancestors Cadmus and his followers had probably introduced from Phoenicia. The Athenians affected to regard the Beotians as naturally stupid 3), but this was by no means a correct estimate of the nation that gave birth to such generals as Epaminondas and Pelopidas, to Hesiod, Pindar, and Plutarch, and who boasted the possession of Mt. Helico sacred to the Muses. Undoubtedly what drew from Aristophanes that shaft of satire was the reputation of the Beotians as excelling in the art of music, and that explains

<sup>1)</sup> Wilkinson, op. cit. vol. I, p. 485. 2) Lemprière's Class. Dict. Aristophanes.

<sup>3)</sup> Lemprière's Classical Dictionary, »Boeotia«.

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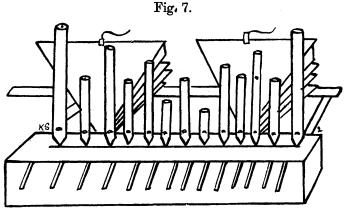
why in \*the Acharnians the impression is given that their renown as droning pipers was proverbial. To us this passage is most important since it gives evidence that the bag-pipe of the 5th century B. C. in Greece had drones, and that the instrument was sufficiently well-known by the people not to require mention by name.

Even Plato has something to say about the bag-pipe, and in the same vein, if I mistake not. The passage reads thus,1):

ταῦτα ω φίλε έταῖφε Κρίτον, εὖ ἴσθ', ότι έγω δοχω άχούειν, ώσπες οί χορυ- I seem to hear murmuring in my ears βαντιῶντες τῶν αὐλῶν δοκοῦσιν ἀκούειν, like the sound of the flute in the καὶ ἐν ἐμοὶ αὕτη ἡ ἡχὴ τούτων τῶν ears of the mystic; that voice I say λόγων βομβεί καὶ ποιεί μη δύνασθαι is humming in my ears. τῶν ἄλλων ἀκούειν.

This, dear Crito, is the voice which

Here again we find in conjunction aulos and bombei; the former indicating a reed instrument, the latter giving an unmistakable clue as to its identity, by the allusion to the humming tone of the bag-pipe drone. Perhaps in time other allusions to this instrument will be traced in the classics. After Plato there is a gap of over two centuries before the invention of the hydraulic organ by Ctesibius or Hero of Alexandria, when we leave the domain of hypotheses for that of certainty. After this period the history of the bag-pipe ceases to bear on the evolution of the organ and therefore has no place here. Under the Roman Empire it rose into favour and occupied a position in Music to which it never attained among the Greeks proper. The Roman emperors and people delighted in the tibia utricularius, as it was styled by them, and also in other wind instruments of coarse unmusical tone. Nero, we hear, towards the end of his life made a public vow that if he continued in the



The Magrepha d'Aruchin. (From Ugolinus.)

peaceable enjoyment of the empire, he would, in the games he designed to give for his success against the rebels, appear upon the stage to manage the water-organ and also to play the flutes (choraules) and bagpipe  $^{2}$ ).

The bellows had during the lapse of centuries no doubt assumed

<sup>1)</sup> Plato, Crito 54 D (Jowett's English Oxford translation 1892).

<sup>2)</sup> Suetonius, Nero, 41 (S. Clarke's translation and text).

pretty much the same shape as at the present day, and consisted of two flat boards connected by folds of goat skin which formed an airchamber; the leather was prevented from collapsing by two or more hoops which acted like ribs. An opening was made in the lower board and veiled on the inside by a flap of leather which acted as a valve, allowing the air free entrance, but preventing its exit. The air-chamber was provided with a pipe of smaller diameter than the valve, and when the upper board was raised, the outer air pressing on the valve entered and filled the cavity; on pressing the board down, the air became compressed, closed the valve and was driven with force through the pipe. The wind thus supplied was of course not continuous, owing to the bellows having to be refilled after each puff; by using two bellows this was in a measure remedied, though the wind was even then not regular. This is the principle of the bellows and when

Fig. 8.



Hydraulic organ. (Carthage Museum).

applied to the early organs, the air was driven through the bellows into the air-chest whence it sought egress through any narrow slits in the lid [mentioned in Kircher's »Magraketha«] which happened to be left free by the withdrawal of the slide; the air was drawn thence into the organ pipe where the tone was produced under the same conditions as for the mashrokitha (Magraketha). This instrument is declared to be the *Magrepha d'Aruchin* which is mentioned in the Talmud.

The only available translation 1), however, is so obscure in the description of this instrument, that I give Ugolino's 2) instead: »The Magrepha d'Aruchin was a musical organ like our church organs, for as the Schilte Haggiborim teaches, it consisted of several rows of pipes and was blown by bellows; it had besides holes and small sliders answering to each pipe, which were set in motion by the pressure of the organist; the vent-holes being open, a wonderful variety of sounds was produced. Whether or no this was the Magrepha used in the Temple at Jerusalem, to which Jerome alludes also in the spurious letter to Dardanus before mentioned, we know not; but we feel sure that some such organ must have existed before the invention of the Hydraulic organ, in which the compression of the air by means of water was an improvement on the bellows, for it afforded a continuous supply of wind which enabled the performer to produce perfectly sustained notes, an impossibility with unweighted bel-A photograph of the most perfect model of the Hydraulic organ yet found is subjoined to complete the subject.

The original is a piece of pottery about seven inches high, excavated from the ruins of ancient Carthage and deposited in the Museum, to whose courteous director I owe the photograph. The great value of this document is that the piece of pottery is not a bas-relief but complete back, front and sides. The artist has copied his model so accurately that we can trace in it every point described by Vitruvius<sup>3</sup>); a fac-simile of this interesting relic of the 1<sup>st</sup> or 2<sup>nd</sup> century A. D., is now being constructed of which I hope to be permitted in a future article to give a full description, together with many photographs. In conclusion, we have seen that the precursors of the organ were primarily the simple reedpipe, the syrinx and the bag-pipe, and secondarily the instruments obtained by the union of the syrinx and bag-pipe, with the subsequent addition of the bellows.

The reed-pipe, syrinx, and bag-pipe, were presumably known in Egypt and Western Asia, as they were in China; but of Greece alone can this statement be affirmed with certainty, for we have found indications that all three instruments were in use there from remote antiquity.

<sup>1)</sup> Talmud translation by Moïse Schwab, tom. VI (Soucca) p. 47, 17; (Tamid) III, 8 and VIII, 6.

<sup>2)</sup> Blasius Ugolinus, *Thesaurus Antiquitatum Sacrarum*, Venetiis 1744—69 Tom. XXXII, p. 1121.

<sup>3)</sup> Vitruvius, Pollio X, 13.



On the Divine Origin of Musical Instruments in Myths and Scriptures  $\,$ 

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## ON THE DIVINE ORIGIN OF MUSICAL INSTRUMENTS IN MYTHS AND SCRIPTURES

## By CLEMENT ANTROBUS HARRIS

O a musician there is only one alternative to believing that music is of divine origin, and that is to believe that nothing is. It comes to such an one as a matter of course that poets, philosophers and theologians in all ages and parts of the world should have spoken of music as "The Divine Art"; "Religion's Handmaid"; "The Voice of God to the soul" (Canon Shuttleworth); "Herald of life to be" (Swinburne); "The Speech of Angels," nay more, "The speech of God Himself" (Charles Kingsley); and "sphere-descended maid," to give, in the words of Collins, an idea to be found in the works of many, if not, indeed, most poets. Among those who have ears to hear, such passages as the following are but the apt expression of a truism. "It is by the odes that the mind is aroused. It is by the rules of propriety that the character is established. It is from Music that the finish is received" (Confucius, Analects VIII. Legge's Edition); "I want another [harmony] to be used by him when he is seeking to persuade God by prayer; rhythm and harmony find their way into the secret places of the soul" (Plato, Republic, III. 399-403, Jowett's translation); "Let us hear a strain of music and we are at once advertised of a life which no man has told us of"(Thoreau); "Away, away! thou [music] speakest to me of things which all my endless life I have not found, and shall not find" (Jean Paul Richter); "The Master puts into music the thoughts which no words can utter, and the description which no tongue can tell" (S. A. Barnett); "Music is a power transcending all other means of expression of ideals, and of eliciting what is most elevating in thought and feeling" (Arthur Watson). The same idea is conspicuous in mythology, Egyptian, Greek and Scandinavian. sons and daughters of the Nile regarded several of their many gods as specially interested in music. Their temple chants they attributed to the goddess Isis. (The Egyptian Maneros, or funeral chants, are believed to be the oldest music in existence). Osiris also was looked upon as a patron deity of song.

representations he is accompanied by the nine female singers whom the Greeks subsequently transformed into the nine muses, just as they transformed Osiris into Phœbus Apollo. forty-two "priestly-books" assumed to be the work of the god That there are two "Books of the Singer." The god Bes (probably a foreign divinity borrowed from Babylonia or Arabia) was honoured as presiding especially over dancing, music and the cosmic art—that is, apparently, music on its more secular side. The Hellenic peoples personified music in Apollo, who learnt his art from the universal god, Pan, and they attributed to it a miraculous power over the forces of nature. The Scalds held that their music was the gift of Odin or Wodin. Among more modern and Christian nations, the nearest approach I can find towards claiming a divine origin for specific melodies is in regard to the ancient chants known as "Gregorian," or "Plainsong." If it is not expressly stated that these liturgical strains were made in heaven, the language used in regard to them—for instance in the Preface to the Altar Hymnal—certainly implies something more than a merely human authorship. Nor can it be denied that the intensely devotional beauty of at least some examplesfor instance the traditional music to the sursum corda—smooths The church historian Socrates, writing the way to such a belief. about A.D. 440, relates that in a vision St. Ignatius saw the heavens opened, and heard heavenly choirs praising the Holy Trinity in alternate chants, and the venerable father was so impressed with this method that he introduced antiphonal singing into the church at Antioch—this must have been, of course, about the end of the first century. Thus a divine origin is claimed for the antiphony of the Christian church, if not for that of the Jewish, of the singing in which antiphony was a marked characteristic. It cannot, however, but strike a musician as strange that Ignatius should have recorded the method in which the celestial choir sang, and not the music itself. Perhaps he was not musician enough to notice, or be able to retain and record, technical details. Even if he was, one of the strangest things about dreams, and perhaps visions, is the vividness with which on waking one recalls some particulars—often trifling—and the impossibility of recalling others. More probably we are intended to understand that the heavenly music transcended anything possible to human voices or systems of notation.

As a natural corollary to this conception of the most ethereal of arts it came about in the period when myths, and the more mythical element in scriptures, had their origin, that not only music in the abstract, but the mechanical means of producing it, instruments, were regarded in many instances as of divine origin.

This phenomenon is most conspicuous among the Hindoos, The former regarded the Vina, to them Egyptians and Greeks. the most charming of all instruments, as having been given to mankind by Sarasvati, the benevolent and kind consort of Brahma. Perhaps it should, however, be added that though Sarasvati is the generally-accepted guardian of music, the principal God of Hindoo music is Nareda, who is represented as playing upon the Vina. Music is closely connected with the worship of the Hindoos: the sacred songs in use are said to be traceable to a remote antiquity, and some are ascribed to gods. These melodies, or "Ragas," are, or were, supposed to be capable of miraculous effects. Some forced men, animals, and even inanimate nature, to move according to the will of the singer, an idea characteristic, as already shown, of Greek mythology. Others could not be executed by any mortal man without the risk of being consumed by flames. The singer Naik-Gobaul, who tried to sing a forbidden Raga, notwithstanding that he took the precaution of standing up to his neck in water in the river Jumna, was consumed by fire. (Whatever conclusion may be drawn from the comparison, it is impossible for the student of the Hebrew Scriptures not to be reminded by this legend of the triumph of Elijah over the priests of Baal, after the twelve barrels of water had been poured over his altar. I Kings xviii.) Another Raga had the precisely opposite effect—that of calling down rain; and by singing it a female singer is said to have saved Bengal from drought and famine.

The Egyptians, as we have seen, had notions in regard to the origin of their most ancient melodies similar to those of the Hindoos. And so they had with regard to their favourite instruments. The invention of the lyre they attributed to the god Thot—a name meaning "Logos" or "Word." Despite this, they did not, according to Apollodorus, dispense in their mythology with the conception of natural means, such as might have been adopted by a human being. The Nile, receding after a flood, left on its banks a dead tortoise. The flesh of the animal being dried and wasted by the sun, nothing was left within the shell but sinews and cartilages, which, being braced and contracted by desiccation, became sonorous when vibrated. Thot, walking along the banks of the Nile, happened to strike his foot against this tortoise shell, was pleased with the sound it produced, and conceived the idea

of the lyre. The earliest lyres, it may be added, were made out of the empty shell of a tortoise with strings affixed to it. the temple at Dakkeh is a picture which shows that if the firegod Ptah did not invent the harp at least he played upon it. In the earlier ages of their history the Egyptians placed the goddess Isis-Hathor (Isis seems to have been especially associated with Hathor as a local deity) in an idealistic relation to the tonal She was, as Ebers tells us, "the holy goddess of love, the mighty heavenly mother of the beautiful-filling heaven and earth with deeds of benevolence." But in later times the conception of her divinity seems to have deteriorated. She became a mere muse presiding over dance, sport, song and, I fear truth compels one to add, licentiousness. I gather that it was at this period that the rope and tambourine were placed in her hand as representing "the captivating power and joy of love." Flutes are very conspicuous in Egyptian representations of orchestras, and for the discovery of this means of producing dulcet sounds the children of the Nile thanked the great god Osiris.

As mythology is said to have been introduced to Egypt by Thot, and carried therefrom to Greece, one cannot be surprised to find that few if any of the instruments in use by the Hellenes were regarded as of human origin. The lyre they attributed to the same god as the Egyptians, but under a different name— Hermes or Mercury. But with this difference, that, at least in some versions, the infant god invented the instrument absolutely, that is, without receiving any suggestions from accident or nature. And he parted with it to Apollo as recompense for certain bulls he had stolen. Apollo, it need hardly be added, was the god of the muses, the inventor of the cithar, and shared with the Egyptian god Osiris the credit of inventing the flute. The syrinx or "pipe," the prototype of all wind-instruments, is the subject of several myths. According to the most popular it was discovered by the god Pan—hence its names of Pan's-pipes, Pandean pipe and Flûte de Pan. According to others we have to credit Apollo, Linus<sup>2</sup> or Orpheus, with it. It was an instrument of almost universal usage—the "fistula" of the Romans, the "koan-tfee" of the Chinese,

<sup>&</sup>lt;sup>1</sup>I put it thus since Thot is described as the "Egyptian Mercury." But there seems to me to be a marked difference in the two conceptions. And would it not be more accurate to speak of Mercury as the Greek Thot, than the other way about?

<sup>&</sup>lt;sup>2</sup>Though it is said that there can be no doubt as to the actual existence of Linus, whom Usher places 1280 B.C., his life is so shrouded in fable and allegory as to be quite admissible here.

probably the "ugab" of the Hebrews, and the "huayra-puhura" of the Peruvians.

Turning now to the Hebrew and Christian Scriptures we find the same idea directly expressed as regards the *designing* of a trumpet; and *involved* in respect to both the designing and making of the harp. Thus we shall add two instruments to the heavensent orchestra, and both of them instruments in use at the present day! "The Lord spake unto Moses, saying, Make thee two trumpets of silver; of a whole piece shalt thou make them" (Numbers x, 1, 2).

And the many "harpers harping with their harps" and the angel sounding the last trumpet, in the Book of Revelation, must, of course, have been conceived by St. John as using instruments made in heaven, and designed there—unless they were copied from those made by men! And surely it is more likely that the human instrument-maker was inspired from above, than the reverse! Lübke maintains that "Early Christianity assumed the garb of the decaying Grecian art," and Emil Naumann, after quoting this passage (History of Music, Cassell's edition, vol. 1, p. 176), goes on to say, "Paintings of this period represent Christ as Orpheus, and as the 'Good Shepherd,' the prototype of the latter being the Greek Hermes, represented as bearing on his shoulders a wether. Orpheus, by his sweet sounds, subdued the demoniacal and animal creation, and Christ, by His loving gentleness, overcame the like evil passions in man. The wether borne by Hermes symbolises the lost sheep saved from destruction in the parable of Christ. Numerous paintings both of Orpheus and Hermes are to be found in the catacombs of the earliest Christian communities of Naples and Rome." Obviously then, the early Christian church was in full sympathy with the belief that the invention and making of musical instruments were among the things of which there has been a "pattern shown in the mount." There is something of this idea, too, in the words of Montanus, the reputed founder, in the second century, A.D., of the sect of the Montanists: "I lie here like a lyre that is played by a divine plec-And it is to be found centuries later in the many carvings in old abbeys and cathedrals in which musical instruments of every kind known at the time are represented as being played by angels. A careful examination of a number of such carvings shows them to consist chiefly of the harp; rebeck (a bowed string instrument brought by the Crusaders from the East, precursor the violin); guitar; flute-a-bec (flageolet); cymbal; pipe and tabor (generally played by the same performer); bag-pipe; and organ. An angel playing a bag-pipe formed part of the ornamentation on the crozier presented to William of Wykeham in 1357.

Like every other great idea, I suppose, this conception of musical instruments as among the works which have come direct from the hands of the great Architect of the Universe, has not wholly lacked opposition. It is strange, however, that the antithesis should have arisen in only one religion, and, to some of us, more strange still that that one should have been Christianity! Yet, so far as a very limited acquaintance with comparative religion enables me to judge, such has been the case.

The attitude in this matter of many of the early Fathers, notably St. Jerome, need not concern us here, since their objection does not appear to have been against instruments as such, or their employment in worship, but to certain instruments, particularly tabrets and cymbals, on account of their association with lewd orgies. And the protests, well known to students of English musical history, made about 1150 A.D. by Ailred, Abbot of Rivaulx, Yorkshire, and by John of Salisbury about the same time, were not directed so much against instruments in themselves—albeit the good Abbot seems a trifle jealous of them—as against their multiplicity, and against musical elaboration, vocal or instrumental.

The first objection to instruments on principle did not occur till a hundred years after the Abbot of Rivaulx penned his diatribe, and it appears to have been the chief musical controversy of the thirteenth century. Strangely enough, the instrument selected for attack was that which nowadays is regarded by many people as the only one suitable for use in divine worship—the organ!

It cannot be said with certainty when the organ was first introduced into churches. In the fourth century it was regarded chiefly as a secular instrument, but, according to Cardinal Bona, was also used in church. On the testimony of Julianus, a Spanish bishop who flourished about 450 A.D., it was not only in use as an adjunct to worship in his day, but was quite common. An old manuscript known as the Utrecht Psalter, generally supposed to be of the fifth or sixth century, indicates the existence of organs in England about the same time. It is evident that the King of Instruments was enthroned in the "courts of the Lord's House" long before the time of Pope Vitalian to whose action, in the year 666 A.D., the installation has by many historians been

credited.¹ Despite the imperfections of the early instruments, they invariably produced the greatest astonishment, and the churches were everywhere ambitious of possessing so efficacious a means of attracting crowds of pilgrims and worshippers.

This appears to have been especially the case in the late tenth and succeeding centuries, when organs multiplied not only in cathedrals but in parish churches and monasteries. Probably it was not the failure, but the success of these instruments which led in the thirteenth century to a violent reaction. A powerful section of the Roman and Greek clergy protested against the use of organs in churches as scandalous and profane. J. J. Seidel in his work *The Organ*, published in 1843 (pp. 80-89) and much quoted by subsequent writers. I can find no other authority for the statement, save those who have obviously copied Seidel. As regards the Greek church, however, the only doubt that can arise is as to the *time* when instruments were first wholly excluded, since the music of the Orthodox church of to-day is entirely vocal, and has been so for centuries. Seidel apart, I am unware of any historian who gives an account of the beginnings of this policy. Antipathy to the organ forms an interesting example of extremes meeting: for it is equally characteristic of the Greek church, the English Puritans of the seventeenth century (who called the instrument "a squeaking abomination" and burnt most of those in England), and the Scottish Presbyterians who, till the last fifty years or so, held the "kist o' whistles" as absolutely taboo where worship was concerned. The small body known as the "Wee Frees" do so still, and pride themselves on it.

Since he is evidently speaking of instrumental music ("without a tongue") one wonders whether good old Isaac Walton had been listening to some puritan fulmination against organs when he wrote:

Music, miraculous rhetoric! that speakest sense Without a tongue, excelling eloquence, With what ease might thy errors be excused, Wert thou as truly loved as thou'rt abused? But though dull souls neglect, and some reprove thee, I cannot hate thee, 'cause the Angels love thee.

<sup>&</sup>lt;sup>1</sup>An extraordinary ignorance of matters musical is often betrayed by men of great scholarship in other branches of learning. Thus Bingham, in his *Christian Antiquities* (Bk. 8, C. 7-16) asks us to believe that the organ was introduced in 1290, A.D., and others have copied the error!



The Double Flutes Author(s): J. Curtis

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## THE DOUBLE FLUTES.

If we are seeking an authoritative solution of the outstanding problems of ancient Greek music, it would seem that the most valuable assistance could be got from a consideration of the  $a\dot{\nu}\lambda \delta s$ , inasmuch as specimens more or less complete are to be found in plenty, scattered through the museums of different countries: in practice, this study has been found the most puzzling of all. Though many of the bodies of such flutes have been found, the mechanism of the mouthpiece, at once the most important and the most perishable portion of the instrument, has naturally disappeared, and all hope of extraneous aid from vase-pictures seems to vanish when we notice that in all the later pictures the mouth of the player, and consequently the mouthpiece of the instrument, is hidden by the  $\phi o \rho \beta \epsilon i a$ , a band passing across the mouth, and encircling the head of the player.

Still I hope to show that not all these difficulties are insuperable: for example, much of the mystery of the  $\phi o \rho \beta \epsilon i a$  disappears when we see two terracotta figures of dancers wearing the  $\phi o \rho \beta \epsilon i a$  without the flutes. It is then clear that this band held the flutes rigidly in place, and we are able to form some conclusion as to the shape of the mouthpieces; but this will be discussed later.

Before settling down to a consideration of the positive knowledge attainable on the subject, it is, however, necessary to brush away some of the cobwebs of speculation or absolute error that have gathered in men's minds. Any knowledge that we can glean can come only from three sources:—the writings of the Greeks, the vase-pictures and statuary, and the discovered instruments. And here I would plead strongly for the uncompromising rejection of statements by late or by Roman authors which are entirely uncorroborated by the other sources of information, or which are contrary to known physical facts. As an example of the folly of such I need only cite the remarks of Vitruvius on the construction of theatres: he avers that in the auditorium were constructed jars resounding to the notes of the diatonic, the chromatic, and the enharmonic genus, and that the actor turned towards these jars as he was singing to increase the resonance of his voice. The evident absurdity of this does not affect the present question; but it is paralleled by the pretence of Varro<sup>2</sup> that

<sup>&</sup>lt;sup>1</sup> F. Lenormant, Terres-cuites Antiques, vol. i. Pl. 37 bis, and vol. ii. Pl. A 4.

<sup>&</sup>lt;sup>2</sup> Res Rust. 1, 2, 15.

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one of the double flutes played the melody in unison with the voice, while the other played the accompaniment; remuneration beyond the dreams of avarice awaits the music-hall performer who will present even a colourable representation of such a feat. No practical musician would admit for a moment the possibility of two such flutes as are depicted on the vases being played simultaneously; still less that they could have rendered different notes at the same time,

The remark of Mr. Howard that the accompaniment played by the flute is admitted  $^3$  to have been higher than the voice part can only mean an octave higher. Nothing is clearer from the literary references to music than the absolute aversion of the Greeks from the hearing of two different musical sounds at the same time; the purists objected even to the octave and to an independent passage for flute or lyre when the voice was not singing. It is manifest that the office of the the flute was to play in unison (or at the octave) with the voice when singing was going on, and it is noticeable that the vase-pictures never show two flute players performing at the same time; also Pausanias in his enumeration of the 'personnel' of a Greek chorus, uses the singular form  $a\dot{\nu}\lambda\eta\tau\dot{\eta}s$ . Miss Schlesinger has shown me a pair of Arab flutes, rigidly united, and blown by a single mouthpiece; but their slightly differing lengths give rise to a kind of 'vox humana' or tremulous effect that would never have been tolerated by the Greeks, with their delicate sense of pitch.

But a more serious and more insidious error, which has held the field for twenty years, is the idea that a small hole near the mouthpiece of the instrument, called the  $\sigma i\rho i\gamma \xi$  or 'speaker,' enabled the flute player to produce on one or both of the tubes the upper octave above the fundamental notes. This has been asserted or implied by Mr. Howard, and quoted by the writer of the article 'Aulos' in the Encyclopaedia Britannica, by Mr. Macran in his notes on Aristoxenus, and I know not how many others. It is simply incorrect.

The source of the error, so far as I can trace it, is in Mr. Howard's admirable study of the 'Aulos or Tibia' in the *Harvard Studies in Classical Philology* (vol. iv. p. 32). It pains me to impugn in any degree the accuracy of so exhaustive and conscientious a work, without which my own investigations could not have been carried far; but Mr. Howard must have been misled on a technical musical point.

In order to make the matter perfectly clear I will quote *verbatim*:—
'As has been said above, the modern clarinet has, near the mouthpiece, a small hole called the 'speaker,' which, when open, enables the performer to produce without effort the harmonic tones (sic) of the instrument. Although this device is not absolutely necessary, it is of the greatest assistance to the performer, especially in producing the first harmonics of the lowest tones.' 5 (The italics are mine.)

<sup>&</sup>lt;sup>3</sup> Based on Aristotle, Probl. xix. 12.

<sup>&</sup>lt;sup>4</sup> V. 25, 2.

<sup>&</sup>lt;sup>5</sup> It is only fair to Mr. Howard to say that

this has every appearance of being merely a verbal slip; unfortunately it has been largely built on.

Now, every clarinet-player, every clarinet-maker, every organ-builder, every student of acoustical theory knows that a cylindrical tube excited by a reed acts as a stopped organ pipe, and will not produce any but the odd harmonic tones of the fundamental. To make the matter intelligible to everybody, if a certain fingering produces the note E, then the opening of the 'speaker' will change the note to the B twelve degrees of the scale higher. No auxiliary hole, or mechanism of any kind in the world, will produce on such a tube with the same fingering the first harmonic, which would in this case be the octave E. The same statement applies with equal force to an oboe mouthpiece if the bore of the instrument is cylindrical (as the normal Greek flutes undoubtedly were).

It therefore follows that the scale performance on a pair of reed-blown pipes, one of which used the 'speaker,' having six holes each, would be as follows:—



In order to supply the missing C, D, E and F, four additional holes would be necessary, making a total of ten holes for a single pipe; and although the Pompeian flutes in the Naples Museum have ten holes, it will be shown later that they did not exceed the octave in compass: even the one with fifteen holes would not have supplied the four additional notes desired.

Having now eliminated from the field of investigation some of the more obvious errors, we are at liberty to examine what is really knowable about the Greek flutes; and the examination will be confined to the normal type of the instrument; though it must never be forgotten that this type varied somewhat during the several centuries with which we have to deal.

First, with regard to the size of the flutes. A careful estimate of the relative length of flute and performer in the vase-pictures gives a probable length of tube varying from 14 to 21 inches. This is confirmed by the dimensions of the extant specimens, and by considerations of playability. The longest of flutes exhumed have a length of about 22 inches, and the models made from them are beyond the stretch of hand and fingers of any but a tall and well-formed person.

Next as regards the form of the flutes. A careful scrutiny of the vase-pictures will convince us that the typical  $\alpha \dot{\nu} \lambda \delta s$  consisted of a long cylindrical tube  $(\beta \delta \mu \beta \nu \xi)$  pierced with holes  $(\tau \rho \nu \pi \eta \mu a \tau a)$ , and surmounted by two movable pieces, the one nearest the player's mouth  $(\dot{\nu} \phi \delta \lambda \mu \iota o \nu)$  being somewhat cone-like in shape, and the intermediate piece  $(\delta \lambda \mu o s)$  roughly pear-shaped. The representations of flutes are provokingly rough in many cases, but even in the most 'impressionist' of them, where the flutes are indicated simply by two pairs of parallel straight lines issuing from the mouth of the performer, the division into three parts is almost invariably marked by two

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cross lines in the correct places. The Naples Museum flutes, as photographed by Mr. Howard, show the two movable parts most clearly, the  $\dot{\nu}\phi\dot{\delta}\lambda\mu\iota\sigma\nu$  being seen to consist of a flaring mouthpiece, suitable for the insertion of a reed, and the  $\ddot{\delta}\lambda\mu\sigma$  of a pear-shaped bulb.

There can be no doubt that the reed formed an integral part of the mechanism of the Greek flute, for Pollux, in his enumeration of the parts of the flute  $^7$  distinctly specifies the reed  $(\gamma\lambda\hat{\omega}\tau\tau a)$  in addition to the  $\delta\lambda\mu\sigma_{\delta}$  and  $\dot{\nu}\phi\dot{\delta}\lambda\mu\nu\sigma$ . Such a reed would not of course be visible in any picture, being covered, except for any part in the mouth of the player, by the  $\dot{\nu}\phi\dot{\delta}\lambda\mu\nu\sigma$ ; and the term used for the whole arrangement  $(\zeta\epsilon\hat{\nu}\gamma\sigma_{\delta})$  may well be deemed to have a relation to the double nature of the reeds employed, as well as to the twin mouthpieces for the two flutes.

For convenience we will assume that the  $\gamma\lambda\hat{\omega}\tau\tau a$  of the earlier flutes was a double reed of the oboe species (the point will be fully dealt with later); and return to the evidence of the vase-pictures. In the earlier vases the two flutes are held at a wide angle, and the cheeks of the player are violently distended. It has been suggested that the  $\phi o\rho \beta \epsilon i a$  was introduced to avoid the necessity of this distention, but the theory is untenable, for in vase-pictures representing trumpeters wearing the  $\phi o\rho \beta \epsilon i a$  the inflation of the cheeks is sufficient to satisfy the most exacting.

If we can imagine the  $\gamma\lambda\hat{\omega}\tau\tau a$  as completely enclosed by the  $i\phi\delta\lambda\mu\iota\sigma\nu$  at this period, and if we remember that in the earlier times the flutes did not extend beyond the compass of an octave at most, we can readily conceive that the nature of the twin instruments may have been similar to that of another primitive instrument, a mediæval one called the 'hautbois de Poitou,' the description of which in the *Encyclopaedia Britannica* <sup>9</sup> is so lucid and so apt to the present subject that I am tempted to quote it *verbatim* (I have taken the liberty of inserting the Greek equivalents in brackets).

'The hauthois de Poitou was a primitive oboe with the reed  $(\gamma\lambda\hat{\omega}\tau\tau a)$  placed in a bulb  $(\delta\lambda\mu o\varsigma)$ , forming an air-chamber, having a raised slit  $(\dot{\nu}\phi\delta\lambda\mu\nu o\nu)$  at the top, through which the performer breathed-in compressed air; <sup>10</sup> as the reed could not be controlled by the lips it was impossible to play with expression on the hauthois de Poitou, or to obtain the harmonic octaves.'

I believe that the earlier double flutes were both played with such reed mouthpieces, and the total compass of the pair was a single octave. In the vase-pictures the early flutes have almost invariably three holes each (a pair on vase E 583 in the British Museum shows three on one, and four on the other flute), and as a pure guess I suggest the plan of fingering indicated by the accompanying diagram (p. 93).

The difference in the lowest note of two apparently equal pipes might

<sup>&</sup>lt;sup>6</sup> The two movable pieces are beautifully shown in Lenormant's *Terres-cuites Antiques*, vol. ii. Pl. E 5.

<sup>&</sup>lt;sup>7</sup> I. 4, sec. 70.

 $<sup>^{8}</sup>$  B 590 and B 591 (B.M.).

<sup>&</sup>lt;sup>9</sup> Vol. xix. p. 951.

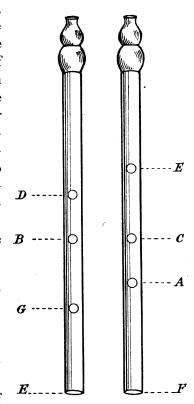
<sup>&</sup>lt;sup>10</sup> The 'chanter' of the Scottish bagpipes is blown on a similar principle.

be due to the different-sized reeds employed, and in this connexion it is interesting to notice that Theophrastus states <sup>11</sup> that both  $\gamma\lambda\hat{\omega}\tau\tau\alpha\iota$  must be cut from the middle shoot of the same reed, or the pipes will not be in tune. The  $\gamma\lambda\hat{\omega}\tau\tau\alpha$  cut from the upper end of the shoot would naturally be less substantial than the other, and might therefore be pushed a little further down the  $\delta\lambda\mu\sigma\varsigma$ ; but this is wholly a speculation, as also the alternate plan of fingering the notes, which latter suggested itself as a possible explanation of the fact that the two hands seem to be employed in the same region of the two pipes.

At this period the two pipes are always held at a wide angle with each other, and probably the one furthest from the normal position has its  $i\phi\delta\lambda$ -

prove entirely outside the mouth of the player, though just touching his lips. At any rate, these guesses have the merit of supplying a possible explanation of the manner in which a pair of flutes excited by double reeds might have been fingered and blown, without attributing to the Greeks any abnormal stretch of hand or power of lip. To the reader unfamiliar with reed instruments it may be explained that the compression of one side of the mouth necessary to produce a note on one flute is practically impossible if the other side of the mouth is occupied.

When the available compass of Greek music was extended beyond the compass of the octave, we should naturally expect some modification in the construction of the flute. As a preliminary chronological observation, it is interesting to note that the period 500–450 B.C. covers both the addition of strings to the kithara, and, according to the vase pictures, an alteration in the holding of the double flutes, which were now held parallel to each other, in such a way as to admit of



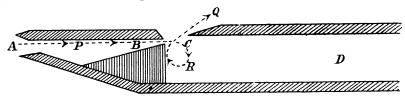
either flute being fingered by both hands together. A whole crowd of significant dates is included in this period; but some of them must be dealt with later.

The extension of musical composition beyond the limits of the octave would evidently demand changes in the management and fingering of the aὐλοί which were, as we have shown, incapable of producing the octave harmonics of the fundamental notes. The first step would undoubtedly be an increase in the number of holes so as to make a whole octave playable on a single flute. It is much to be regretted that the date of Diodorus the Theban who increased the number of holes, according to Pollux, is not to be found, but doubtless it falls within this period.

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Judging from the majority of the flute-tubes found, we should conclude that at this period, at any rate, the number of holes was five or six. With this number of holes, as will be shown, the compass of a single flute could be extended to an octave. This would naturally necessitate the fingering of each flute by both hands, and accordingly we find that about this period (500–450 B.C.) the flutes are represented as held parallel to one another, so that the two hands could manipulate either one or the other. But we are still no whit nearer to the solution of the fundamental problem of the Greek double flutes: how to produce two octaves with two flutes of equal length and practically equal hole-distances; if both were cylindrical, and excited by reeds. When we face this problem honestly, and give it up as insoluble, we are on the highway to a satisfactory conclusion. The second pipe could not have been blown on the reed-principle.

The only alternative principle of blowing is that of the flageolet, flute, or flue organ-pipe (all of which are identical in excitation, however much external appearances may differ). Although this principle is the same as that of the ordinary penny whistle, I hardly feel inclined to apologise in this paper for a detailed explanation of it.



The breath of the player (P) enters the mouthpiece (A) and is constricted into a flat thin stream (B). As this strikes the knife-edge (C) it is cut into two parts. The first and larger part (Q) issues into the open air. The other smaller part (R) tries to enter the tube (D), but is resisted by the inert mass of air therein contained, through which, however, it sends Having performed this work, and lost its force. a pulse of compression. it (R) is now dragged out into the open air by friction with the moving stream of the larger portion (Q) of the air. Its removal causes a pulse of rarefaction in the air contained in the tube, and these two pulses together constitute a complete vibration of the air in the tube. vibrations, occurring many times in a second, produce the musical tone of the tube; and it is manifest that the longer the tube the more time the pulses will take to traverse its length, and therefore the fewer the number of vibrations per second, and the lower the note produced. If the edge is not properly placed in relation to the air stream, too much or too little air tries to enter the tube, and the pipe does not 'speak.' The main object of this explanation is to make perfectly clear that the breath of the performer does not enter the tube of the instrument but passes out through the slit into the open air (as anyone can convince himself if he plays a note on a penny whistle having first filled his mouth with smoke). The importance of this point will be seen later in connexion with an illuminative passage of Pollux.

My attention was first drawn to this point by investigation of the possible way of blowing the Castellani bronze flutes in the British Museum. The identical nature of the moulding at the embouchure proclaims them a pair of double flutes, but they are closed at the end nearest the mouth of the performer, and it therefore seems impossible that they can have been held at an oblique angle and played like a modern flute, especially as both hands have to be employed on each instrument. After much speculation as to any possible way of applying a reed mouthpiece to the embouchure, it occurred to me that they might have been blown on the principle of the flue organ pipe, and that it was worth while to try to construct an experimental instrument on such principle. Accordingly a section of bamboo garden cane was pierced with holes so that it would play as an ordinary modern flute. The section between the embouchure and the closed end was then slightly cut down so as to form a flat surface a little lower than the plane of the fingering holes. Above this was lashed by means of waxed thread a piece of soft metal tubing, squeezed almost flat at the end further from the mouth of the player. The flattened end of the tubing was so adjusted that the stream of air issuing from it struck the upper edge of the embouchure, and the instrument emitted its notes as if blown in the ordinary manner. A sketch of the experimental instrument is appended:—



A—Metal tubing. B—Flattened end of A. C—Sharpened edge of embouchure. F—Body of flute. L—Lashing of waxed thread.

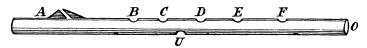
It will be curious later to see how closely this purely hypothetical construction resembles the plan of the actual  $\sigma \acute{\nu} \rho \iota \gamma \xi$   $\mu o \nu o \kappa \acute{a} \lambda a \mu o \varsigma$ . For I am in a position to assert, and, I hope, to prove that, at any rate from 490 to 350 B.C., the double flutes  $(\emph{i}\sigma o \iota \ a \dot{\nu} \lambda o \acute{\iota})$  were of practically equal length but of different bore, the left-hand thinner one being blown with a double reed like that of an oboe, and the right-hand thicker one being played on the flageolet or  $\sigma \acute{\nu} \rho \iota \gamma \xi$  principle. The latter, of course, produced notes an octave higher than the equal lengths of the other pipe.

The first step in the proof comes from an actual model of the Castellani flutes in the British Museum. These two flutes are made of bronze, the 'Perfect' (so christened because its upper end is undamaged) having six holes, and the 'Imperfect' five. By the kindness of the Keeper of Greek and Roman Antiquities I was enabled to make accurate measurements of these, tracing the outlines of the holes on paper laid over the instruments themselves. A pair of metal flageolets was obtained and cut down to the requisite lengths; the existing holes were covered over, and new ones bored in accordance with the measurements.

The 'Perfect' model was spoiled, but the 'Imperfect' gave what

appeared to be portions of the Dorian scale; but neither cross-fingering nor calculation of lengths gave any prospect of the production of the fifth note of the scale (B). However, when the upper octave was tried by overblowing and suitable cross-fingering, a complete Dorian scale was produced.

A table of measurements and a diagram of fingerings are appended; but, as others will follow, it seems desirable to explain the plan of lettering adopted for all.



A, the embouchure; B, C, D, etc., the upper fingering-holes; U, the under thumb-hole when existent; O, the open end.

I have since found out that Mr. Howard gave very careful measurements of these and other flutes; and his figures reduced to the same plan of measurement are given parallel with my own: the slight discrepancies are mainly due to the fact that he measured to edges of holes, and I to centres In the fingering diagrams the closed holes are shown by black dots, the open ones by blank circles.

	DISTAN	CE IN CM.		DIAMETER		Fin	GERI	NG F	or N	OTES	:	
e mon terminal	J. C.	Howard.	Hole.	in mm.	E	F	G	A	В	C	D	Е
AВ	5.35	5.3	1	10	•	•	•	•	•	0	0	•
$\mathbf{AC}$	12.25	12.28	2	9	•	•	•	•	•	•	•	•
AD	17:55	17.55	3	8	•	•	•	0	•	•	•	0
ΑE	20.4	20.1	4	9	•	•	0	0	•	•	0	•
ΑF	23.3	23.25	5	7	•	0	0	0	•	•	•	•
AO	25	26.45	Bore	15								

IMPERFECT BRONZE FLUTE.

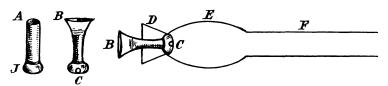
The notes are a whole tone lower than our modern pitch; but as that is a semitone above the pitch of Handel's time, no impropriety has been felt in describing as E a note of the same pitch as our modern D.

The immediate point in connexion with this flute is that no single or double reed could possibly produce the E and the B with the same fingering, and as no other fingering will produce the B, it must have been blown on the  $\sigma \dot{\nu} \rho \nu \gamma \xi$  plan.

Our present problem is to reconcile this deduction with the obvious fact that the  $\gamma\lambda\hat{\omega}\tau\tau a$  or reed is an integral part of the mechanism of all  $a\dot{v}\lambda o\dot{t}$ , as is shown by many literary references. We gather from Theophrastus <sup>13</sup>

<sup>13</sup> *Hist. Plant.* iv. 11.

that the  $\gamma\lambda\hat{\omega}\tau\tau a$  was made from a section of a reed, which included one of the joints. The most suitable part of the reed was the middle shoot; the under joint produced the  $\gamma\lambda\hat{\omega}\tau\tau a$  for the left-hand pipe, and the one further from the root the right-hand one. After being submitted to continued pressure to flatten the open end, the edges of this end were pared (for the older flutes) to a great degree of thinness, and thus would be produced a reed similar to that of the modern oboe. This reed was inserted into the  $\dot{\nu}\phi\dot{\lambda}\mu\nu\nu$  with the  $\sigma\tau\dot{\nu}\mu a$  or sharpened end projecting into the mouth of the player, and the playing was precisely like that of a modern oboe. If the preceding explanation is not sufficiently clear for readers not familiar with wood instruments, the following diagram may make it more intelligible:—



- A, section of reed, cut off at a joint, J.
- B, same section flattened and pared at open end to produce  $\sigma\tau\delta\mu\alpha$ , and a small hole C pierced through joint.
- D, ὑφόλμιον, into which the γλῶττα B was inserted, and held rigid.
- E, δλμοs, air-chamber by which the vibrations excited by the reed were controlled.

When the compass of the flute was extended beyond the octave, and the right-hand pipe became a  $\sigma \dot{\nu}\rho i\gamma \xi$ , a new method of cutting and arranging the  $\gamma\lambda\hat{\omega}\tau\tau a$  was adopted. The section of the reed was cut and partially flattened as before, but instead of being pared to two knife-edges, it was cut off at a rather obtuse angle, so as to form a narrow flat wind-channel. This  $\gamma\lambda\hat{\omega}\tau\tau a$  was inserted in the  $\dot{\nu}\phi\dot{\delta}\lambda\mu\nu\nu$  in a direction opposite to the old one, i.e. the  $\sigma\tau\dot{\delta}\mu a$  was furthest from the lips of the performer, and adjacent to the  $\delta\lambda\mu\nu$ . A sloping channel was cut in the upper part of the  $\delta\lambda\mu\nu$ , sharpened to a knife-edge at the portion opposite to the  $\sigma\tau\dot{\delta}\mu a$  of the  $\gamma\lambda\hat{\omega}\tau\tau a$ , with a small open air-space between, and we have an arrangement exactly similar to a flageolet or flue organ-pipe. As this arrangement is so very important in the realisation of Greek flute-playing, a diagram both in section and in plan is appended (p. 98).

If the reader unfamiliar with acoustical theory will refer back to the earlier portion of the paper, he will at once see how perfectly the definition of Pollux 14 fits the foregoing:—'E\pi\lambda \delta \delta \sigma \delta \

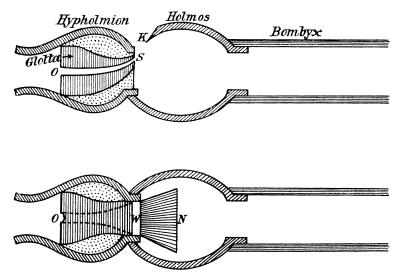
The critical reader may by this time have begun to feel that there is too much hypothesis about the foregoing, but the following long and important passage from Theophrastus seems to me to give sufficient support for all the statements and assumptions made  $^{15}$ :— $\tau\dot{\eta}\nu$   $\delta\dot{\epsilon}$   $\tau o\mu\dot{\eta}\nu$   $\dot{\omega}\rho\alpha\dot{\epsilon}a\nu$   $\epsilon\dot{\epsilon}\nu\alpha\iota$ 

J. CURTIS

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πρὸ ᾿Αντιγενίδου μὲν ἡνίκ᾽ ηὔλουν ἀπλάστως ὑπ᾽ ἀρκτοῦρον Βοηδρομιῶνος μηνός τὸν γὰρ οὕτω τμηθέντα συχνοῖς μὲν ἔτεσιν ὕστερον γίνεσθαι χρήσιμον καὶ προκαταυλήσεως δεῖσθαι πολλῆς, συμμύειν δὲ τὸ στόμα τῶν γλωττῶν, ὁ πρὸς τὴν διατορίαν εἶναι χρήσιμον. ἐπεὶ δὲ εἰς τὴν πλάσιν μετέβησαν καὶ ἡ τομὴ μετεκινήθη τέμνουσι γὰρ δὴ νῦν τοῦ Σκιρροφοριῶνος καὶ Ἑκατομβαιῶνος ὥσπερ πρὸ τροπῶν μικρὸν ἢ ὑπὸ τροπάς, γίνεσθαι δέ φασι τρίενόν τε χρήσιμον καὶ καταυλήσεως βραχείας δεῖσθαι καὶ κατασπάσματα τὰς γλώττας ἴσχειν τοῦτο δὲ ἀναγκαῖον τοῖς μετὰ πλάσματος αὐλοῦσι.

The suggested meaning of this (with expansions and explanations in brackets) is:—'Before the time of Antigenidas, when they used to play the flute in the natural manner  $(\mathring{a}\pi\lambda\mathring{a}\sigma\tau\omega_{5})$ : that is with the  $\gamma\lambda\mathring{\omega}\tau\tau a$  in its original position) the cutting (of the reeds) was seasonable about mid-September (when thoroughly ripened). For (the reed) cut in this manner



VERTICAL AND HORIZONTAL SECTIONS OF SYRINX.

O, orifice of γλῶττα. S, στόμα or flattened wind-channel. K, knife-edge of ὅλμος. W, open wind-space. N, cut down surface of ὅλμος.

becomes useful after an interval (for maturing) of several years, and needs much preliminary blowing (to determine the amount of paring necessary for best tone of reed). And the mouth  $(\sigma\tau\delta\mu a)$  of the reed  $(\gamma\lambda\hat{\omega}\tau\tau a)$  closes up (the two edges shrivel up and close together) which is useful for the piercing tone (of the oboe character. This gives a fairly clear idea of the original  $a\dot{v}\lambda\dot{o}s$  and its method of blowing). But when they changed into the artificial method (of blowing: i.e. the syrinx principle just described and illustrated) the time of cutting also was moved. For now they cut (the plants) in the months of June, July, or August, about or a little before the summer solstice (while still full of sap, and therefore less patient of paring). And they say it (the reed) becomes useful in three years (needs less time to mature) and needs little experimental blowing; and the opening of the  $\gamma\lambda\hat{\omega}\tau\tau a$  retains its shape (remains constant: a matter of supreme importance in the 'voicing'

of a flageolet-principle pipe), and this is necessary to those who play with the artificial method.'

Πρὸ ἀντιγενίδου supplies us with a most useful date. Antigenidas lived in the time of Alexander 356–323 B.C. and was an innovator. Presumably he introduced the plan of having both pipes played in the  $\sigma \dot{\nu} \rho \nu \gamma \xi$  method (μετὰ πλάσματος); so that he used the σύριγγες τέλειαι of Pollux' list of instruments.<sup>17</sup> But we have evidence that the syrinx right-hand pipe was in use both before and after. Midas of Agrigentum in 490 broke his ζεύγη, but won the competition by playing μόνοις τοῖς καλάμοις τρόπω σύριγγος, 18 which can only mean in reality that he used the syrinx pipe for the double octave, as can be done by overblowing (blowing across the edges of the pipes themselves is unthinkable). Ion of Chios (died 421) refers to the μάγαδις αὐλός. 19 which must have been a flute that, unlike the primitive αὐλός, would play the upper octave. Aristotle refers to the syrinx pipe (κἂν κατασπάση τὰς σύριγγας), 20 as also Aristoxenus (κατασπασθείσης γε της σύριγγος); 21 while in a succeeding age Plutarch uses the expression της σύριγγος ἀνασπωμένης,<sup>22</sup> which implies a return to the older method of playing  $(\partial \pi \lambda \dot{\alpha} \sigma \tau \omega_S)$ .

This passage of Plutarch's is well worth quoting in extenso, as it gives a key both to the construction of the flutes, and the manner in which they were played: -διὰ τί τῶν ἴσων αὐλῶν ὁ στενώτερος βαρύτερον φθέγγεται καὶ διὰ τί τῆς σύριγγος ἀνασπωμένης, πᾶσιν ὀξύνεται τοῖς φθόγγοις, κλινομένης δὲ πάλιν βαρύνει. 'Why does the thinner of the equal flutes sound deeper? And why when the syrinx hole [in the  $\phi o \rho \beta \epsilon i a$ ] is uncovered, do all the sounds become sharper [by an octave], and when it is closed again they get deeper?"

The thinner tube being the oboe-blown one could not break into the harmonic octave, while the syrinx-blown one, if of equal thinness, would have been almost certain to do so. A similar relation of thickness exists between the flute and the oboe of to-day. The manner of playing is easily under-The mouthpieces of the two flutes were inserted in the two holes of the  $\phi o \rho \beta \epsilon i a$ ; the stoma of the oboe-reed entered the player's mouth, but the ύφόλμιον of the syrinx pipe fitted its hole, which was closed at its inner end by a movable flap, which could be shifted  $(\kappa \alpha \tau \alpha \sigma \pi \hat{a} \nu)$  or  $\hat{a} \nu \alpha \sigma \pi \hat{a} \nu$  by the tongue of the performer. When the flap was closed, no air could escape into the syrinx pipe, and the lips of the player were quite free to exert the necessary pressure on the oboe-reed. When the flap was moved aside, the syrinx pipe would speak without any lip pressure, and the oboe reed, no longer compressed by the lips would cease to give any sound.

I should like to have traced Mr. Howard's source for his view of the syrinx, but unfortunately the reference he gives cannot be found in England. From his words I guess that he rendered a passage to the effect that the syrinx was a hole near the mouth of the player; if it read that the syrinx had a hole near the mouth of the player, it would harmonise with the foregoing passage and others omitted here.

<sup>17</sup> iv. 10, 77, Salmo's reading. 18 Schol. <sup>16</sup> Suidas, 221. 18 Schol. to Pindar, Pyth. xii. 1. <sup>19</sup> Athenaeus, xiv. 35. 22 Non posse suav., 1096a.

The two flutes were probably connected by metal bands, traces of which have been found by Mr. Howard, both on the Pompeian and the Castellani flutes.

The most valuable evidence afforded by the flutes is, however, with regard to pitch and scales. Without going into tedious details, it is necessary to point out that actual measurements of existing remains are not an absolutely safe guide. The length of the ὅλμος, and the exact point at which the oboe reed began to vibrate, are matters of fundamental importance. All Mr. Howard's results are vitiated by the fact that he added a mouthpiece some seven or more centimetres in length, thus altering both pitch and relationship of notes emitted. In the following details the actual length has been increased (except in the Castellani flutes, where it was not necessary, the embouchure being exactly known) by a small amount experimentally determined after many failures. The assumption has been made that if the model constructed played a recognisable scale, that was the scale played by the original instrument. It seems hard to imagine it could have been anything else.

## THE 'PERFECT' BRONZE FLUTE.

The original model having been spoiled, a bamboo garden cane was pierced according to the measurements, and bored with a flute embouchure. This gave a Dorian scale in the lower octave (i.e. without overblowing); but it was rather flat in comparison with the 'Imperfect' flageolet. Accordingly another metal flageolet was procured, and accurately bored by my friend Mr. Kirchenwitz, an expert in metal work; the diameters of the holes being diminished by  $\frac{1}{64}$  of an inch, to allow for the reverse taper of the tube. A just Dorian scale was then playable, exactly an octave below the 'Imperfect' one.

	DISTAR	NCE IN CM.			FINGE	RING F	or No.	res :		
	J. C.	Howard.	Е	F	G	A	В	C	D	Е
AB	4.5	5.2	•	•	•	•	•	•	•	
$\mathbf{AU}$	8.3	8.2	•	•	•	•	•	•	0	•
AC	10	10.75	•	•	•	•	0	0	•	•
AD	17:2	17:3	•	•	•	0	•	0	0	•
ΑE	20.7	21.3	•	•	0	0	0	•	•	•
AF	23	23.5	•	0	0	0	0	0	0	•
AO	24.6	24.5								

The next point of attack was the Elgin flutes in the British Museum, which are made of sycamore wood, are not a pair, and were probably found in a tomb near Athens. These will be here referred to as the 'Straight Sycamore' and the 'Curved Sycamore.'

The cane for the 'Straight Sycamore' was pierced side by side with the instrument, but many failures were made before discovering the exact allowance to make for the reed. Finally the model played a Lydian diatonic

scale, and its nominal C was a fourth lower than the nominal E of the Dorian flutes (as theory demands).

CIPITO A	TOTTO	CITTO	3507373
STRA	HEART	SYCA	MORE

	DISTAN	ICE IN CM.			FINGE	RING F	or Nor	res:—		
	J. C.	Howard.	C	D	E	F	G	A	В	C
AB	9.7	8.2	•	•	•	•	•	•	0	0
AU	12	10.8	•	•	•	•	•	0	0	0
$\mathbf{AC}$	15	14.4	•	•	•	•	0	•		0
AD	19.4	17.5	•	•	•	0	•	•	•	•
ΑE	21.8	20.7	•	•	0	•	•	0	0	•
AF	25.8	24.8	•	0	•	•	•	0	0	•
AO	32.5	31.2								

The 'Curved Sycamore,' on account of its fragility and shape, was not suitable for my methods of measurement; but, having become aware of Mr. Howard's measurements, and their close relation to my figures, it seemed worth while to make a model from his published details, adding 1.3 cm. for the mouthpiece as in the former case. A dulciana organ pipe of the narrowest obtainable gauge was procured and the holes duly bored. It was then found that all the notes from D up to B were quite in tune with each other, but the low C was too sharp, and the upper C was not obtainable by The addition of a sliding card-board extension to the lower any fingering. end of the pipe enabled me to determine the correct length for the fundamental C, and the upper C was then quite obtainable by the ordinary fingering for the modern flute. It therefore seems likely that the instrument originally had a detachable bell, such as clarinets and oboes now have, and such as is shown in some vase-pictures. As the fingering is exactly that of a modern flute, it is unnecessary to give it.

CURVED SYCAMORE.

	Distanc	E IN CM.	
	Adjusted.	Howard.	Note.
AB	14.1	12.8	В
AU	17:5	16.2	A
$\mathbf{AC}$	20.6	19.3	G
AD	24.1	22.8	F
ΑE	27.6	26.3	E
AF	32.8	31.5	D
AO	41.5	35.6	C

It is, perhaps, hardly necessary to say that the actual pitch was considerably lower than that of the 'Straight Sycamore.'

Further confirmatory experiments must be compressed into brief space, though valuable additional results are suggested by some of them. The next objects of attention were the four ivory flutes unearthed at Pompeii in 1867, now in the Naples Museum, and measured by Mr. Howard, whose figures are here followed. Those numbered 76891 and 76893 are apparently a pair, or, if not, single members of two identical pairs. Number 76893 has eleven holes: these were bored in a bamboo fitted at the upper end with a bas-The fingering was exceedingly difficult, on account of the great length of the instrument; indeed, the lowest three holes were quite inaccessible to me, though a larger hand might reach them. The holes not required for a diatonic scale were then plugged with cork, roughly representing the perforated metal bands on the original instrument, which could be turned round as required, either to open or to close the hole. The model then gave for the upper holes six upper notes of the Dorian scale, while the lowest but one (F), which I could not blow, was represented by its third harmonic (C). I have therefore no hesitation in saying that the compass of the flute was a single octave, that the extra holes would probably produce the notes of other scales, and that the E was in tune with the Castellani bronze flutes of the British Museum (the pitch of course being an octave lower). In the appended list of lengths measured and notes produced by blowing, the notes that have not actually been sounded are marked with a query. Notice is especially called to the probable G which is provided on the instrument: this is of the utmost interest, as it would play a note written in the Phrygian Hymn to Apollo which was not included in any of the συστήματα which have come down to us, though the interpretation of the letter-sign used is quite clear on general principles.

IVORY FLUTE FROM POMPEII (76893).

Hole.	DISTANCE IN CM.	Note.
AB	21.4	E
AU	24.4	D
$\mathbf{AC}$	26.6	C# (?)
AD	29.1	C
AΕ	32:14	В
$\mathbf{AF}$	34.3	B <sub>2</sub> (?)
$\mathbf{AG}$	36.6	$\mathbf{A}$
$\mathbf{AH}$	38.6	G# (?)
ΑI	42.6	G
AJ	46.3	F# (
$\Lambda K$	48	F (?)
AO	49.2	E (?)

The consideration of the probable results of the untried holes in this model gave rise to the suspicion that the other holes were required for different scales (harmoniai), as it is abundantly evident that the Greeks had no idea of our modern chromatic scale. As the manipulation of an experimental instrument fitted with a double reed is a somewhat perilous matter, it was decided to construct a bamboo model of the Pompeian flute No. 76891, with a flute embouchure, and to fit the holes with movable leather bands in imitation of the metal bands of the original. The model thus constructed tended to confirm the suspicion, but two difficulties detracted from its usefulness. In the first place the extreme length of the instrument made its fingering in a horizontal position quite impossible for the farthest holes; and the leather bands worked loose after being turned two or three times. Still, although unsuitable for demonstration afterward, and too evanescent for systematic record, the notes obtained rendered it extremely likely that the original, which had eleven holes (like No. 76893), would play the Dorian, Phrygian, and Lydian harmoniai, and was therefore the Panharmonion referred to by Plato.<sup>23</sup>

It remained, therefore, to seek a record of a flute with many holes, but of a more manageable size. This was finally found in a flute described by M. Loret <sup>24</sup> as belonging to Sir G. Maspero. It is said to have been found in 1888, at Akhmim in Egypt (the ancient Panopolis). It may be objected that this is travelling beyond the bounds of Greek music, but the remarkable similarity to the Castellani flutes of the illustration given, together with the identity with the Pompeian flutes of the number of holes, seems to point to this being a flute of Hellenic origin; if archæologists decide otherwise, it is a strong argument in favour of the Egyptian origin of all Greek music; personally, such a decision would appear to me to conflict with a great mass of other evidence. M. Loret himself says: 'La flûte appartenant à M. Maspero sort absolument de l'ordinaire, non seulement par la forme de son embouchure, mais encore par la disposition de ses trous.'

Before going into detail about the performance of this flute, it is interesting to note how closely M. Loret (who has evidently no suspicion as to its correspondence with Greek flutes) describes the ὅλμος and ὑφόλμιον of the syrinx, as previously reconstructed in this article: 'Le bec est un fragment de roseau assez épais et d'un diamètre nécessairement supérieur à celui de la flûte. Il mesure 8 cm. de longueur. La partie dans laquelle s'introduit l'extrémité de la flûte a un diamètre de 1·3 cm. et est entourée, ainsi que le bout de la flûte qu'elle devait recevoir, d'un enroulement de fil recouvert de poix. Cette embouchure n'est certainement pas à anche (is certainly not a reed). Le roseau est bien trop épais pour avoir servi d'anche, et, d'ailleurs il n'y a été pratiqué aucune ouverture. Il n'y a donc point de languette. L'extrémité est coupée perpendiculairement à l'axe de l'instrument et présente une section transversale de forme presque triangulaire. . . . .

<sup>23</sup> Republic iii. 10, 399 c. Τί δέ; αὐλοποιοὺς ἡ αὐλητὰς παραδέξει εἰς τὴν πόλιν; ἡ οὐ τοῦτο πολυχορδότατον, καὶ αὐτὰ τὰ παναρμόνια αὐλοῦ

τυγχάνει ὄντα μίμημα;

<sup>&</sup>lt;sup>24</sup> Journal Asiatique, 8th series, vol. xiv, pp. 212, et seq.

L'embouchure présente donc la forme de deux troncs de cône ayant leur sommet commun et dont l'un a une base circulaire tandis que l'autre a une base presque triangulaire.'

The method of investigation adopted was as follows. As a preliminary a model was bored with the holes which most nearly corresponded with those of the Castellani flutes, which are almost precisely of the same length. This model, as was hoped, gave a fairly correct Dorian scale.<sup>25</sup> With this amount of solid ground to stand on, one was encouraged to bore a bamboo with flute embouchure and the complete set of eleven holes according to M. Loret's measurements, here appended.

MASPERO FLUTE.

No.		LENGTH IN CENTIMETRES.
1	AB	4
2	$\mathbf{AC}$	6.4
3	ΑĎ	8.6
4	ΑE	10.9
5	$\mathrm{AU}_1$	12.4
6	ΑF	14.1
7	$\mathbf{AG}$	16.2
8	$\mathbf{AH}$	18.8
9	$\mathbf{AU}_2$	19.9
10	ΑI	20.9
11	AJ	21.7
	$\mathbf{AO}$	25.2

On this model it was possible, by covering the proper holes with wafers (afterwards by stopping them with wooden plugs) to obtain three fingerable arrangements of holes on which could be played the Dorian, Phrygian, and Lydian harmoniai respectively. The final step was to take a metal flageolet, fill up the existing holes, and bore others according to the given measurements; next to cover each hole with a perforated sliding metal band, as was done with the Pompeian flutes, by which a hole might be mechanically stopped or left open. The holes left open to produce the different harmoniai are specified here, as there are two distinct points of interest with regard to them.

Напмо	NIA	١.				]	Hole	s O	PENE	D.			
Dorian	•	to an absolutions****	1	2	3		5		7			10	11
Phrygian			1	<b>2</b>	3		5		7	8		10	
Lydian			1	2		4		6	7		9		

<sup>25</sup> It may be mentioned incidentally that no reproduction of any of the flutes gives a true effect unless all the holes are bored.

The first and most obvious fact is that all the holes are needed; and hole nine, which appears to be most awkwardly placed for the right thumb, is only used when ten and eleven are covered by the bands, so that there is no practical difficulty in covering the holes with the fingers for every scale.

The other fact is so illuminating with regard to the feeling of the Greeks for just intonation (the matter in which their pre-eminent delicacy of ear is really displayed) that it deserves a rather more detailed treatment. A glance at the table of measurements will show that the ninth and tenth holes are but a centimetre apart; so close that if both were on the same side of the instrument they could hardly be fingered. Now the uncovering of hole ten produces the second note of the Phrygian harmonia, whereas if we open hole nine instead we get the second note of the Lydian harmonia; and those familiar with the intervals of Greek scales will at once remember that the first step in the Phrygian scale is a minor tone, and the first in the Lydian a major tone. This one point is conclusive in proving that the Greeks recognised the distinction between the major and minor tone, and therefore could not have used Pythagorean intonation.

This series of experimental reconstructions does not claim to be in any sense exhaustive; there are many other possibilities of producing more notes by cross-fingering, or the partial uncovering of holes; but it is submitted that if the scales herein detailed can be played on the models, there is an overwhelming probability that such scales were played on the originals.

No flute playing the Phrygian tropos has been seen by the writer, but M. Loret describes a flute in the Turin Museum (No. 12 in catalogue) which gives a Phrygian scale, if the speaking length of the tube be taken about three centimetres less than he gives it: it is impossible to say without seeing the actual instrument whether or not this reduction is justified.

To sum up, it is claimed that these investigations show:—

- 1. That the lowest note of the normal octave of the Dorian tropos, the Harmoniai,<sup>26</sup> and the enharmonic genus was about a tone lower than our modern E (continental pitch).
- 2. That the Dorian, Phrygian, and Lydian tropoi (and by inference the remainder of the fifteen) really had the relative pitches suggested by the notation. The 'Curved Sycamore' hints that there was also a Lydian scale of arbitrarily low pitch, possibly the 'Chalaro-Lydian' apparently alluded to by Plato (Rep. 399A).
- 3. That the Harmoniai were actually in existence and in use by the Harmonikoi.
- 4. That the Greeks used true intonation, and (by inference) neither the Pythagorean theoretical system nor (as a rule at least) the quarter-tone enharmonic.

J. Curtis.

the Tropoi are playable on the white notes of a piano beginning on different notes.

<sup>&</sup>lt;sup>26</sup> It may be as well to reiterate that the Harmoniai were a set of scales beginning on the same note but with differing intervals, while



The Reconstruction of Ancient Greek auloi

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# The reconstruction of ancient Greek guloi

J. G. Landels

Of all the surviving remains of ancient Greek musical instruments, the fragments of auloi are the most important and the most informative; though long the subject of study (Howard 1893; Schlesinger 1939; Becker 1966) the difficulties involved in interpreting their evidence, and in any attempt to reconstruct a complete instrument from them, are very severe. The purpose of this article is to survey the main problems and to pinpoint the main difficulties.

Firstly, the surviving instruments and fragments are not a truly representative sample. Most of the important archaeological sites (e.g. Delos, Perachora, Corinth and the Athenian Agora: Landels 1964) have yielded a quota of fragments; but the great majority of them were found among rubbish deposits, and were there precisely because they were damaged and useless. An important exception to this is the Brauron *aulos*, deposited in an underground spring as a votive to Artemis (Landels 1963). This means that the only instruments which we can hope to reconstruct from them will be cheap, simple ones; no professional player would ever be likely to throw away a serviceable instrument, of the elaborate and expensive kind which we know to have been in use from the late fifth century B.C. onwards, with metal keywork and ornamentation. Once again, there are a few exceptions – the four Pompeian *auloi*, which may possibly have been in an instrument-maker's workshop when the eruption occurred (Howard 1893; 47–55; Ward-Perkins and Claridge 1976: (no. 199), and the metal instruments found at Meroë, which may have been funerary offerings (Bodley 1946).

Secondly with very few exceptions these fragments are of bone or ivory, and are listed as such in the excavation reports. But we know from literary evidence that the most common material for the *aulos* was reed (*kalamos*) – a very perishable substance. Because the lengths of reed available to the instrument-maker were much longer than the available pieces of bone (usually from the tibia of a deer or sheep) the finger-hole section of the body would have been made in one piece, whereas that of a bone instrument had at least one join in the middle. Needless to say, apart from very rare exceptions, only one of the bone pieces survives.

Another even more serious problem arises from the fact that the *aulos* was a double pipe, and that the two pipes (this is beyond reasonable doubt) sounded together. This means that in order to gain information on the playing technique from surviving remains,

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we need to find two complete, or almost complete pipes, which can confidently be treated as a matched pair. The only two which come anywhere near to meeting this condition are the Elgin *auloi* in the British Museum, and it is by no means certain that they really belong together.

What, then, can be learned from the typical bone fragment, with four finger-holes? An example c. 150 mm. long is shown in plate 65, based on the late Hellenistic Fragment D from the Athenian Agora (Landels 1964: 397-8). This represents part of the simple form of the instrument shown in fifth-century vase-paintings being played by amateurs and hetaerae.

From these illustrations it is clear that a section of this type came below the bulb or bulbs normally shown at the mouthpiece end of the instrument. There does not seem to have been any consistency in the choice of upper end for spigot and lower for socket, or vice versa, though almost certainly the sections of any one instrument would be the same in this respect. Hole I is obviously the index-finger hole sounding the highest note, and there is a socket at that end of Fragment D; but Fragment H must be the lower extremity of another instrument, and it has a spigot at its upper end.

Below a section of the Fragment D type there would normally be one or two more sections, the adjoining one containing the last finger-hole (IV, stopped by the little finger) and, usually, a vent-hole which sounded the lowest of the six notes in the scale obtainable. The Brauron *aulos* is the only certain case in which both the sections are preserved; there is another possible example in Corinth (Wegner 1963:32).

Even without the lower section, it is possible to make a guess at the pitch of the upper four notes of the scale. The principal factor in determining this is the length of the air column between the tip of the reed and the nearest open hole. Since it is clear from surviving bulbs that the bore inside them did not expand, but remained straight throughout the instrument, we can posit a hypothetical length x between the top end of the section (A) and the tip of the reed, having the same internal diameter as the surviving piece; this, when added in turn to the distance from A-I, A-T, A-II and A-III, will give a set of four resonant lengths. The frequencies of the notes produced would be inversely proportional to these lengths, and if the four frequencies stand in ratios to each other which make some kind of sense in terms of known ancient Greek intervals, then it is possible that the supposed value for x is approximately right. This value may be arrived at by either of two methods, (a) by making an estimate, based on the length of A-B, of the probable length of two bulbs and the extruding part of the reed, or (b) by positing a given interval between two particular holes, and calculating the length xrequired to produce that interval. For example, one could posit a fourth (frequency ratio 4:3) between holes I and II; x could then be found from the equation

$$\frac{x + (\text{distance A to I})}{x + (\text{distance A to II})} = \frac{3}{4}$$

If it were then found that other intervals were recognizable (e.g. II-III in the ratio 9:8, a major tone) then some confidence could be placed in the estimate of x.

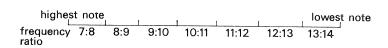
This purely mathematical method has been used to make calculations of the scales of some *auloi*; but though it is superficially attractive, it cannot be regarded as anything more than an approximative procedure (Landels 1968). It rests on the assumption that

the reed could have been perfect, and perfectly matched to the resonator, and it takes no account of certain factors which in practice affect the pitch of all the notes. These are:

- (a) End correction. The Rayleigh formula (+.3d) is adequate for a rough check, but is not accurate when added to the measurement from the centre of a lateral hole.
- (b) Variations in temperature and humidity in the player's breath. The effect of these is approximately, but not exactly, the same on all the notes.
- (c) The drag effect of the constant (non-oscillating) air current through the instrument.
- (d) The complex and very powerful effects of the reed structure, breath pressure and embouchure control. In the imperfect world of real wood-wind instruments, there is no such thing as a reed which does not have its own quirks and resonances, or a player who does not, on occasion, pull the pitch of the instrument up or down, by accident or fatigue or over-enthusiasm. Though it is not likely that the instrument-maker would deliberately bore the holes to give a false pitch, it must be remembered that there was virtually no standardization and certainly no mass-production of instruments, many of which would have been custom-made for an individual player. These and other matters are referred to in my interim account of the *aules* now in the Museum of Greek Archaeology, Reading University (Landels 1968) (plate 66).

If a section of this type is all that remains of an *aulos*, only the most speculative and tentative suggestions can be made about the pitch of the other two notes in the scale. It does appear that on some more complete instruments the scale divides at the centre, and has a compass of about a seventh – in the terms of ancient Greek music, two conjunct tetrachords. If this could be firmly established as the norm, it would help greatly in assessing the pitch of the lowest note when the lower section is lost, or in confirming that it really 'belongs' when it is preserved.

Another method has been employed in the reconstruction of scales from incomplete instruments which must – unfortunately, since it gave promise of interesting results – be rejected. It was based on the theory of Kathleen Schlesinger (1939) regarding *aulos* scales according to which the holes in the *aulos* were all equally spaced, with the result that no two intervals in the scale were exactly alike; in descending order each was slightly smaller than the one before, giving a pattern of this type:



If this were really true, it would be possible to reconstruct a complete *aulos* from only two data – the distance between any two holes, and the number of equal fractions into which the instrument was divided (the 'modal determinant').

To criticize Schlesinger's lengthy and elaborate arguments would require an extended article; suffice it to say in very brief (and therefore dogmatic) summary that her evidence was largely taken from musical cultures other than ancient Greek, that she seriously misinterpreted some of the literary evidence, and that she succeeded in accommodating only one surviving instrument – one of the Elgin *auloi* – to her theory. Moreover, in

order to do this she found it necessary to use a single beating reed, for which the ancient evidence is not adequate. Accordingly, the reconstructions of the Meroë *auloi* by N. B. Bodley (1946), based on the Schlesinger principles, cannot be accepted as valid.

So far we have discussed only the pitch of the notes; when it comes to re-creating the tone or timbre of an aulos, the problems are still more acute (MacGillivray 1961). There is no modern instrument which combines, as the aulos did, a double reed with a cylindrical bore. Any reed designed for a modern instrument has been endowed, by a long process of trial and error, with exactly the right characteristics which will combine with the resonator to produce the right tone. As a result, it will tend to impart to a facsimile of an aulos something of that tone quality. A bagpipe drone reed, which is 'wrong' in that it is a single reed, but convenient because its stem is of about the right size, gives an aulos replica a single-reed sound like that of a bagpipe drone, and slightly reminiscent of a clarinet. The same facsimile played with a cor anglais reed produced a sound spectrum (analysed from a tape-recording) not unlike that of a cor anglais. When a bassoon reed was used, the tone was harsher and louder - again, not unlike that of a badly-played bassoon. A further disadvantage of the last two reeds was that they were badly mis-matched to the resonator, with the result that the pitch was very unstable, and could be raised or lowered at will by as much as a tone. The aulos, in its day, had a special reed of its own, carefully designed and (no doubt) often modified to give subtle effects of tone and dynamics, capable of the great variety of styles needed to match the great variety of musical contexts in which it was played. To re-create such a reed is no easy matter.

14.v.1980

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#### **Abstract**

Landels, J. G.

#### The reconstruction of ancient Greek auloi

In this article, the four main problems involved in reconstructing ancient Greek *auloi* are discussed, namely (1) the remains are incomplete, damaged, and not a representative sample, (2) theoretical calculations from resonant lengths do not take account of the vagaries of reeds or playing techniques, (3) Schlesinger's theory of equidistant holes is not supported by good evidence, and (4) the tone quality of the instrument cannot be reproduced without accurate knowledge of the reed construction.

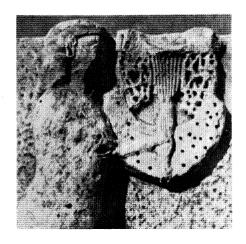




Plate 61 (far left) Xanthos. Relief. Sixth century B.C. (Istanbul Museum)

Plate 62 (left) Assyrian quartet (oblique and straight lyres, timbrel and cymbals). First millennium B.C. (Louvre)





Plate 63 (far left) Elamite lute and small rectangular lyre, cylinder seal. Fourteenth century B.C. (Louvre)

Plate 64 (left) Babylonian lute. c. 1800 B.C. terracotta. (Louvre)

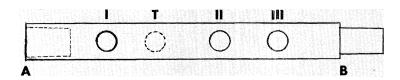


Plate 65 Upper finger-hole section of a typical aulos



Plate 66 Sections of the Reading aulos separated during restoration



An Early Fifth-Century Athenian Revolution in Aulos Music

Author(s): Robert W. Wallace

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# AN EARLY FIFTH-CENTURY ATHENIAN REVOLUTION IN AULOS MUSIC

## ROBERT W. WALLACE

A FTER a brief opening section to recover one piece of information, the following pages reconstruct several revolutionary developments in the use of the aulos for music research and social playing in early fifth-century Athens, and the reaction against these developments that began around mid-century.<sup>1</sup>

#### (A) LAMPROCLES THE ATHLETE (?)

According to the *scholia vetera* to Ar. *Clouds* 967, Eratosthenes reported that the poem including the words Πάλλαδα περσέπτολιν δεινὰν θεὸν ἐγρεκύδοιμον (partly quoted in *Clouds* by *Dikaios Logos*) was attributed by Phrynichus to the work of Λαμπροκλέους τοῦ ἀθλητοῦ, Μίδωνος υἱοῦ (ἢ μαθητοῦ Σ<sup>E(2)</sup>). This description of Lamprocles is quoted twice by Holwerda, again by Koster, and also by Page.

<sup>1</sup> Thanks to Peter Wilson, Timothy Moore, *HSCP*'s editor, and its excellent readers for comments on this text. Rich in ideas and also bibliography, Peter Wilson's essay "The *aulos* in Athens," in *The Performance Culture of Athenian Democracy*, ed. S. Goldhill and R. Osborne (Cambridge 1999) 58–95, is in many respects complementary to the present discussion. I am grateful to its author for sending me an advance copy.

<sup>2</sup> Is this Phrynichus the comic poet? So, e.g., B. F. Grenfell and A. S. Hunt, *The Oxyrhynchus Papyri* XIII (London 1919) 146, and K. J. Dover, *Aristophanes Clouds* (Oxford 1968) 215 *ad loc*.

<sup>3</sup> D. Holwerda, "De novo Chamaeleontis studiorum testimonio," *Mnemosyne* iv 5 (1952) 230 n. 2 (the Peripatetic Chamaeleon knew of a different tradition about this poem: see next note) and *Prolegomena de comoedia scholia in Acharnenses, Equites, Nubes*, Fasc. 3. 1 (Groningen 1977) 185 ad loc.; W. J. W. Koster, "Ecce iterum Chamaeleon," *Mnemosyne* iv 6 (1953) 63; Page *PMG* no. 735. On the tendency of ancient biographical traditions to confuse fathers and teachers (including our example of Lamprocles' Midon), see L. Lehnus, "Scopelino 'padre' di Pindaro," *Rend. Ist. Lomb.* 111 (1977) 78–82. Nothing else is known about Midon.

Dover duly attributes the figure "Lamprokles the athlete" to  $\Sigma^{E(2)(3)}$  in his edition of *Clouds*.<sup>4</sup>

Three other reports are transmitted about Lamprocles, in addition to Clouds' implication that the poem quoted by Dikaios Logos belongs to or before the Marathonian period. First, Athenaeus 491c calls him dithurambopoios, a composer of dithyrambs, performed to the aulos. Second, according to ps.-Plutarch De musica 1136d (possibly based on the fourth-century Peripatetic Aristoxenus), "the harmonikoi in their historical works say that Pythoclides the aulete invented [the Mixolydian harmonia] and also that Lamprocles the Athenian, realizing that the disjunction in this harmonia is not where almost everyone supposed it to be, but at the top of its range, gave it the form of the series from paramese to hypate hypaton." Third, according to the scholiast to Plato (?) Alcibiades I 118c 6, "Pythocleides taught Agathocles who in turn taught Lamprocles who in turn taught Damon." Pythocleides is elsewhere said to have been one of Pericles' teachers, and Agathocles one of Damon's and Pindar's.<sup>6</sup>

Else was right to call the report by the scholiast to *Alcibiades* I an "obviously apocryphal *diadoche*." We should keep in mind, however,

<sup>4</sup> Dover, *Clouds* 215, also setting out the variants and different attributions of this verse. See also G. Arrighetti, "Il POx XIII 1611: alcuni problemi di erudizione antica," *SCO* 17 (1968) 85–89, and Page *PMG* p. 379. The discussion in *POxy* XIII 1611. 160–176 (= Chamaeleon fr. 29c Wehrli) refers (as does Σ E Ar. *Nub*. 967) to Chamaeleon's uncertainty as to whether this text was composed by Lamprocles (Chamaeleon cited Phrynichus' attribution) or else by Stesichorus (on whom Chamaeleon wrote a book: Ath. 620c).

<sup>5</sup> Trans. A. Barker, *Greek Musical Writings* I, *The Musician and his Art* (Cambridge 1984) 221 (with n. 112 on the attribution to Aristoxenus). According to ps.-Plutarch (*De mus.* 1136c–d), Aristoxenus himself claimed that the Mixolydian *harmonia* was invented by Sappho. Barker (ibid. n. 113) provides an explanation of the scalar modification which ps.-Plutarch here attributes to Lamprocles.

<sup>6</sup> Pythocleides: Pl.(?) Alc. I 118c, Plut. Per. 4, cf. also Pl. Prt. 316e. Agathocles: Pl. Lch. 180c-d, Vit. Pind. Ambros. p. 1 line 12 Drachmann (see also Pind. vit. metr. line 11).

Despite Abert's suggestion (RE 12 [1924] 587; the possibility is countenanced, apparently independently, by D. A. Campbell, Greek Lyric IV, Loeb Cl. Lib. 1992, p. 321), there is no justification for identifying Lamprocles with Lampros ho mousikos. Lampros is said to have been the teacher of Sophocles (Ath. 20f) and was regarded as "highly reputable" (eudokimos, along with Pindar, Pratinas and Dionysius of Thebes) by Aristoxenus ([Plut.] De mus. 1142b = fr. 76 Wehrli, see also Nep. 15.2). He is called "inferior" by Plato's Socrates (Mnx. 236a) and attacked with great vituperation as a "water drinker" and other things by the comic poet Phrynichus (fr. 78 K.-A. = Ath. 44d).

<sup>7</sup> G. Else, "'Imitation' in the fifth century," *CP* 53 (1958) 89 n. 55 (contrast J. S. Morrison, *CQ* 5 [1958] 205 ["all quite plausible"]). Lehnus, "Scopelino" 81, conjectures a

that the scholiast's claim could have as its basis some similarity between Pythocleides the aulete, Agathocles, and Lamprocles from which student-teacher relationships were later inferred.<sup>8</sup> Ps.-Plutarch actually specifies that according to the *harmonikoi*, Lamprocles developed a *harmonia* "invented" by the aulete Pythocleides.

In the light of these several associations of Lamprocles and the aulos, the scholiasts'  $\Lambda \alpha \mu \pi \rho \sigma \kappa \lambda \acute{\epsilon} \sigma \upsilon \varsigma$  τοῦ ἀθλητοῦ, "Lamprocles the athlete," may be emended to read  $\Lambda \alpha \mu \pi \rho \sigma \kappa \lambda \acute{\epsilon} \sigma \upsilon \varsigma$  τοῦ αὐλητοῦ: "Lamprocles the aulete," as in Scopelinus ὁ αὐλητής (Vit. Pind. Thom.: Pindar's teacher) and Pythocleides ὁ αὐλητής (in ps.-Plutarch), whose work Lamprocles is said to have revised. The paleography is straightforward,  $\upsilon$  replacing  $\theta$  which is similar. We also have no reason to associate Lamprocles with athletics. Although Pindar might sometimes use athletic metaphors to describe his poetic endeavors, 9 so far as I know the epithet "athlete" is never applied to a musician.

#### (B) A REVOLUTION IN AULOS MUSIC

The preceding emendation, if correct, adds to our meagre knowledge of an important figure in the history of early fifth-century music. It also

late fifth-century source, possibly Damon, for these and other musical relationships. However, no written work by Damon (if he wrote anything) seems to have been accessible after his lifetime (see R. W. Wallace, "Damone di Oa ed i suoi successori: un'analisi delle fonti," in R. W. Wallace and B. MacLachlan ed., *Harmonia Mundi. Music and Philosophy in the Ancient World*, *QUCC* Suppl. 5 [1991] 32–45, esp. 42–45). For a different suggestion concerning the source of these statements, see next note.

<sup>&</sup>lt;sup>8</sup> On the doubtful value of ancient claims of student-teacher relationships and the possibility that such claims were narrative metaphors for hypotheses of influence, see J. Fairweather, "Fiction in the biographies of ancient writers," *AncSoc* 5 (1974) 262–263; M. R. Lefkowitz, *The Lives of the Greek Poets* (Baltimore 1981) 128–133; and below. The views of the *harmonikoi* as recorded in *PHibeh* 13 (see Barker, *Musical Writings* I, pp. 183–185) are close to those of Damon (see, e.g., W. Anderson, *Ethos and Education in Greek Music* [Cambridge, Mass., 1966] 149–150; Blass believed that Damon himself was the subject of this text: see B. F. Grenfell and A. S. Hunt ed., *The Hibeh Papyri*, Part 1 [Oxford 1906] 45–46). Therefore, since *De mus*. 1136d shows that the *harmonikoi* wrote about Lamprocles, these *harmonikoi* may have been the source for the scholiast's report of the relationship between Lamprocles and Damon. (Alternatives are Chamaeleon, who certainly mentioned Lamprocles [see n. 4 above], or Aristoxenus himself [with Lehnus, "Scopelino" 78].)

<sup>&</sup>lt;sup>9</sup> See M. R. Lefkowitz, "The Poet as Athlete," SIFC 3.2 = 77 (1984) 5-12.

helps to place Lamprocles in the context of revolutionary developments in aulos music at Athens during this period. Aspects of this revolution and the reaction against it have long been noted, beginning with Aristotle and Athenaeus as we shall see. Despite the shadowy nature of these developments and the ambiguous, fragmentary evidence that documents them, more can be said to identify the poet-musicians who participated in this movement, and the specific issues they raised.

Traditionally linked (in Greece) with Boeotia and the Peloponnese,<sup>11</sup> at Athens the aulos was taken up both by citizen players and by serious students of music in the early fifth century. Aristotle writes (*Pol.* 1341a 26–35 [trans. Sinclair and Saunders]):

Our predecessors were right in prohibiting the use of the pipes [auloi] by the young and by free men, though at an earlier period it was permitted. This is what took place: as resources increased, men had more leisure and acquired a loftier pride in standards of virtue; and both before and after the Persian Wars, in which their success had increased their self-confidence, they fastened eagerly upon learning of every kind, pursuing all without distinction; and hence even playing on the pipes was introduced into education . . . At Athens playing the pipes took such firm root that many, perhaps the majority, of the free men took part in it.

Athens' aulos revolution had two components, expanding that instrument's role in social playing and in musical experimentation and

<sup>10</sup> See also A. Schneider, Zur Geschichte der Flöte im Alterthum (Zurich 1890) 35–37 (excellent, though brief and now outdated); C. del Grande, Espressione Musicale dei Poeti Greci (Naples 1932) 86–101; E. Roos, Die tragische Orchestik im Zerrbild der altattischen Komödie (Lund 1951) 228–229; M. L. West, Ancient Greek Music (Oxford 1992) 34; W. Anderson, Music and Musicians in Ancient Greece (Ithaca 1994) 149.

11 For the Peloponnese, see esp. Clonas of Tegea ([Plut.] De mus. 1132c, 1133a, 1134b, Poll. 4.79), Echembrotus of Arcadia (Paus. 10.7.4) and Sacadas of Argos (Paus. ibid. and 2.22.8–9, [Plut.] De mus. 1134a–c, Hesych. s.v. Σακάδιον, and Chamaeleon ap. Ath. 184d); cf. also the local tradition that the aulos was invented by the Troezenian Ardalos son of Hephaistos: Paus. 2.31.3, cf. Plut. Conv. sept. sap. 149f–150a, Steph. Byz. s.v. Άρδαλίδες. For the aulos's Spartan associations, see Roos, Orchestik 219 with reff. For Boeotia, whose most famous aulete was perhaps the late fifth-century Pronomus, see, e.g., Theophr. Hist. Pl. 4.11.4, Plut. Alc. 2, Ar. Ach. 860–866, Cratinus ap. Poll. 7.88, Chamaeleon (ibid.), and on Pronomus, Paus. 9.12.5–6, Ath. 184d and the text below. H. Guhrauer, "Zur Geschichte der Aulodik bei den Griechen," Progr. Waldenburg 1879, provides a brief survey of these early figures.

research. Aulos experimentation and research are attributed first to Lasos of Hermione, who worked in Athens under (Hdt. 7.6) and after the Peisistratids, and who is said to have written the first book about music. Ps.-Plutarch (*De mus.* 1141c) reports, "Lasos of Hermione, by altering the rhythms for the music of the dithyramb, and by pursuing the example of the multiplicity of notes belonging to the aulos (and so making use of more notes, widely scattered about), transformed the music that existed before him" (trans. Barker). According to the *Souda*, Lasos introduced to Athens annual dithyrambic contests, performed to the aulos as we have noted. 13

Lamprocles "the aulete" and *dithurambopoios* may be associated with these developments. An Athenian, his cognomen and dithyrambs link him with the aulos. Ps.-Plutarch reports his research and experimentation with *harmoniai* (*De mus.* 1136d, quoted above, in the third paragraph of this essay). This passage further suggests an association with Lasos, who first (in extant texts) refers to *harmoniai* as a musical form (fr. 702 Page), as against the older form of music called *nomos*.

Pythocleides and probably also Agathocles also had a role in this movement. According to ps.-Plutarch as we have seen, Pythocleides "the aulete" invented the Mixolydian *harmonia*, which Lamprocles then revised. The Athenian Agathocles is mentioned together with Pythocleides in Pl. *Prt.* 316e. According to the scholiast to Pl. (?) *Alc.* I 118c, Agathocles was a student of Pythocleides. Finally, Agathocles is variously attested as the teacher of Pindar and Lamprocles (who then taught Damon). As we have noted, it is unlikely that the source of this *diadoche* had any compelling documentation for it. However, actual evidence for any student-teacher relationships would carry less significance—students sometimes repudiate their teachers—than the presumptive basis of the scholiast's claim, viz. some poetic or musicological similarity or link between these persons.

Finally, Pindar may also be considered a participant in Athens' aulos

<sup>&</sup>lt;sup>12</sup> Souda s.v., cf. Mart. Cap. 9.936: musicam divulgavit mortalibus.

<sup>13</sup> The Marmor Parium (A 46) dates this introduction to 509 or 508: see A. W. Pickard-Cambridge, Dithyramb, Tragedy and Comedy<sup>2</sup>, rev. T. B. L. Webster (Oxford 1962) 17–20. I hope to consider Lasos in detail in a subsequent publication. For preliminary remarks see R. W. Wallace, "The sophists at Athens," in D. Boedeker and K. A. Raaflaub ed., Democracy, Empire, and the Arts in Fifth-Century Athens (Cambridge, Mass., 1998) 212–213.

<sup>&</sup>lt;sup>14</sup> See schol. Pl. (?) Alc. I 118c 6 and Vit. Pind. Ambros., quoted earlier in this essay.

revolution. 15 Two Lives of Pindar variously identify his teachers as Scopelinus "the aulete," Agathocles, and Lasos (in this case for the lyre). Possibly reflecting later suspicion of the aulos as we shall see, the Vita Thomana says that Scopelinus "taught Pindar the aulos, and when he saw that he had unusual skill, handed him over to the lyric poet Lasos of Hermione, who taught him the lyre." After mentioning Scopelinus, the Vita Ambrosiana states that "some say that Pindar's teacher at Athens was Agathocles, others Apollodorus." As we have seen, Agathocles was probably part of the new aulos movement. Lefkowitz has suggested that these traditions may reflect the Athenians' attempt to claim Pindar, as they also claimed Tyrtaeus. 17 She compares the tradition that the Thebans fined young Pindar for writing a dithyramb in praise of Athens (= fr. 76 S.-M.), and the Athenians paid the fine (Vit. Ambros. I p. 1. 16). On the other hand, Pindar had various associations with Athens (Ol. 8.54–66, Nem. 4.93, 5.49, 6.67, Pyth. 7), and in 497/6 is reported to have won a victory in Athens' dithyrambic contests (*POxy* 2438). He also wrote dithyrambs in praise of Athens, and to the Thebans: "Oh! the gleaming and the violet-crowned, and the sung in story, the bulwark of Hellas, famous Athens, city divine" (fr. 76, trans. Sandys, see also 75, 77, 78, written for Athenian occasions). Even if based on inadequate evidence, biographical traditions may indicate what were later judged to be Pindar's musical affiliations. Pindar is not said to have been the student of Simonides, who also worked in Athens but was not sympathetic to the aulos revolution (as we shall see).

Furthermore, in fr. 70b S.-M., Pindar praises new dithyrambic styles (something associated with Lasos), seeming to allude favorably to new dithyrambic asigmatism: "In earlier times the song of the dithyrambs crept along, stretched out like a rope, and the 's' came out base-born from men's mouth" (trans. Barker). According to Athenaeus (455c, and see 624e–f; also Strabo 10.3.13), asigmatism was an experiment of Lasos. Barker suggests that Pindar rejected Lasos's condemnation of

<sup>&</sup>lt;sup>15</sup> See very briefly Pickard-Cambridge, *Dithyramb* 23, and G. Comotti, *Music in Greek and Roman Culture* (Baltimore 1989) 29–30; see also D. A. Campbell, *The Golden Lyre* (London 1983) 183–184.

<sup>&</sup>lt;sup>16</sup> Pind. Vit. Ambr. I p. 1.2-5, 11-15 and Pind. Vit. Thom. = Scholia vetera in Pindari carmina I, ed. Drachmann (Leipzig 1903) 4.10-15. For Agathocles, see n. 6 above and Lehnus, "Scopelino." Apollodorus is otherwise unknown.

<sup>&</sup>lt;sup>17</sup> Lefkowitz, *Lives* 59–60.

sigma, because his poem does not avoid them. However, we cannot suppose that even Lasos regularly avoided sigmas in his poetry. According to Cleonides as Athenaeus quotes him (455c), "Pindar composed these lines almost as a riddle, because he was unable to abstain from the letter 's', and they did not approve of it." Pindar's dithyrambic style was certainly regarded as bold and innovative in later antiquity: per audaces nova dithyrambos / verba devolvit numerisque fertur / lege solutis (Hor. Carm. 4.2.10–12). One can only imagine the music that accompanied Pindar's dithyrambic "krotala clatter . . . the loud-sounding wails and frenzies and shouts of the river nymphs" (fr. 70b9–14 S.-M., trans. Barker).

Finally, although the aulos had Boeotian associations and a common Greek tradition attributed its invention to the Phrygian Hyagnis, father of Marsyas, <sup>19</sup> in 490 Pindar, a Theban, attributed its invention to Athena (*Pyth.* 12). <sup>20</sup> Although we cannot prove that Pindar himself invented this tale, it is nonetheless a rarity in the ancient sources. <sup>21</sup> Pindar's story hellenizes, and possibly associates with Athens, an instrument which the Greeks typically regarded as foreign. <sup>22</sup> Pindar

In addition Corinna, also Boeotian, is said to have claimed that Athena taught the Delphian Apollo how to play the aulos ([Plut.] *De mus.* 1136b). This may be significant in the present context even if Corinna was not an early fifth-century poet but Hellenistic and archaizing. See M. L. West, "Corinna," *CQ* 20 (1970) 277–287 (3rd century B.C.), and C. H. Segal, "Pebbles in Golden Urns: The Date and Style of Corinna," *Eranos* 73 (1975) 1–8, *Aglaia* 315–326 (perhaps inclining toward the late 3rd century). (In *Camb. Hist. Class. Lit.* I *Gk. Lit.* [1982] 240, Segal remarks that the question "remains open.")

<sup>&</sup>lt;sup>18</sup> Barker, Musical Writings I, p. 59 n. 20, and see del Grande, Espressione 87.

<sup>&</sup>lt;sup>19</sup> See Ath. 624b citing Aristoxenus, [Plut.] *De mus.* 1132f, 1133d-f, *Marm. Par.* A 10, *Anonym. Bellerm.* 28, Apul. *Florid.* 1.3, and other sources listed in H. Huchzermeyer, *Aulos und Kithara in der griechischen Musik bis zum Ausgang der klassischen Zeit* (diss. Emsdetten 1931) 14 n. 57. For the myths about Marsyas, see B. Leclercq-Neveu, "Marsyas, le martyr de l'aulos," *Metis* 4 (1989) 251–268.

<sup>&</sup>lt;sup>20</sup> See A. Köhnken, "Perseus' Kampf und Athenes Erfindung," Hermes 104 (1976) 263–265. For other reports of Athena and the aulos, see Diod. Sic. 5.49.1, Hygin. Fab. 165, and Plut. De cohib. ir. 456b, quoting lines from a satyr play possibly by Euripides (= TrGF 2 Adesp. 381). On Pindar's use of the myth in Pyth. 12, see C. Segal, "The Gorgon and the Nightingale: The Voice of Female Lament and Pindar's Twelfth Pythian Ode," in Aglaia. The Poetry of Alcman, Sappho, Pindar, Bacchylides, and Corinna (New York 1994) 85–104. On the aulos in this text, see B. Gentili and F. Luisi, "La Pitica 12 di Pindaro e l'aulo di Mida," QUCC 49 (1995) 7–31.

<sup>&</sup>lt;sup>21</sup> See otherwise Nonnus, *Dionys.* 40.228–233 and the schol. to Ov. *Met.* 4.618 ff.

<sup>&</sup>lt;sup>22</sup> See F. Frontisi-Ducroux, "Athéna et l'invention de la flûte," *Musica e Storia* 2 (1994) 242.

wrote a *prooimion* in honor of the ancient aulete Sacadas of Argos (Paus. 10.30.2). He praises the power of "the lovely song of the auloi to stir the dolphins in the waveless deep" (fr. 140b S.-M.).<sup>23</sup>

Although personal details about the early poets must always be approached with caution, the evidence here seems reasonably consistent. At Athens Pindar studied both stringed instruments and the aulos, probably with Lasos, and he was influenced by the new dithyrambic styles.

By contrast, both Simonides and Anacreon apparently distanced themselves from the aulos revolution. Simonides "the lyric poet" (ho lurikos, ho melopoiôn) recounted the story of Marsyas and the aulos in a way unflattering to Marsyas, with his "greedy mouth." According to Pliny NH 7.204, Simonides added an eighth string to the lyre. The tradition is doubtful, but suggests that Simonides was at least later linked to experimentation with stringed instruments. In Aristophanes' Wasps (1410–1411), Lasos is said to have competed against Simonides and remarked, "I don't care." In Clouds 1352–1354, Simonides is a symbol of old-fashioned poetry, someone Strepsiades would enjoy.

As for Anacreon who like Lasos worked at the court of Hipparchos ([Pl.] Hipparch. 228c), Critias (DK 88 B 1.4) is said to have reported that he was αὐλῶν ἀντίπαλος, φιλοβάρβιτος (= fr. 181 Gentili). Critias may have known something about these issues, as according to Chamaeleon (Ath. 184d = fr. 3 Wehrli) he himself was famous for playing the aulos. Simonides' epitaph for Anacreon praises his barbiton (fr. 126 D.). The Hellenistic historian and biographer Neanthes of Cyzicus (ap. Ath. 175e) stated that Anacreon actually invented the barbiton. It is easy to imagine a situation of court rivalry between Lasos and Anacreon, as Lasos was Simonides' rival later. We must note, however, that along with the many-stringed pektis (fr. 69, 72 D.) and "twenty-stringed magadis" (fr. 70 D.), Anacreon also mentions aulos music without comment (fr. 18 D.). As with Lasos and Pindar, all of these poet-musicians must have worked with a variety of instruments.

An important period of musical development can thus be reconstructed during the shadowy decades of early fifth-century Athens. During these years, innovations in instrumentation and musical experimentation first attested for Lasos were developed by Pindar, Lam-

<sup>&</sup>lt;sup>23</sup> The dolphins' fondness for aulos music was or became a standard conceit: see Eur. *Elec.* 435–436, Ar. *Frogs* 1317–1318.

<sup>&</sup>lt;sup>24</sup> Plut. *De cohib. ir.* 456c = Simonides fr. 160 D.

procles, Pythocleides and probably also Agathocles. Details of the relationships between these poet-musicians cannot be reconstructed. They may have been friends, teachers and students, or rivals. However, their participation in a nexus of musical innovations is apparent. Therefore, an era of great poetic and (in particular) dramatic evolution at Athens was also marked by revolutionary changes in music.

In a broader social context, Aristotle's Politics indicates that the aulos became more widely practiced and respected in Athens both before and after the Persian Wars. In the light of Aristotle's own condemnation of the aulos (as we shall see), his testimony is especially striking in that he and other conservatives believed that at the time of the Persian Wars Athens was ably managed and the Athenians behaved themselves well.<sup>25</sup> His report about the aulos finds some confirmation in the admittedly exiguous sources for musical practice during this period. As we have seen, according to (ps.-?)Plato (Alcib. I 118c) and Plutarch (Per. 4), Pericles (b. ca. 495) studied with Pythocleides and Damon. Pythocleides was known as an aulete, and Damon is said to have been his pupil. According to Aulus Gellius 15.17 citing Pamphila (a woman writer of Miscellanies at the time of Nero), Pericles summoned the Theban Antigenidas to teach the aulos to his ward Alcibiades (b. ca. 450), "something then considered honestissimum." The evidence of vase painting is also suggestive. An unsystematic canvass of the photographs of Attic vases in my university's library yielded 124 scenes of aulos players between ca. 560 and ca. 400 B.C. As might be expected from representations on drinking cups and kraters, in all periods the great majority of auloi are depicted in Dionysiac symposion or komos scenes. Of sixth-century vases, 23 of 29 illustrations are of this type; the other six show processions, musical performances, and war dances. This percentage of drinking scenes is roughly typical of my samples from 500-450 and 450-400. However, uniquely in the period 500-450, five scenes (out of some 56 vases) depict young men being taught to play the aulos. Vase paintings, of course, are not snapshots of Athenian daily life. They need only show that aulos education became a subject of interest to vase painters, and also cannot prove that upper-class aulos education was new. At a minimum, however, the painters' new awareness of aulos education does imply a more conscious conceptualization of such education, and quite possibly therefore

<sup>&</sup>lt;sup>25</sup> See Arist. *Pol.* 1273b35–1274a21, 1304a17–24 and, e.g., Isoc. 7.36–55.

its greater prominence in Athens. This prominence is directly attested by Aristotle's *Politics*.

### (C) A REACTION

By mid-century, however, the aulos had become controversial. Henceforth it ceased to be the principal instrument of Athens' musical researchers, and in some upper-class circles it fell sharply out of fashion for both education and citizen playing.<sup>26</sup> In *Pol.* 1341a26–35, after commenting on the popularity of the aulos at the time of the Persian Wars, Aristotle states: "But at a later date, as a result of actual experience, the playing of auloi went out of favor, as men became better able to discern what tends to promote virtue and what does not." The reduced role of the aulos in favor of stringed instruments is first documented in the plastic arts. From mid-century the satyr Marsyas was frequently represented, beginning with Myron's famous sculpture group probably of the 450s (Athena throws the aulos away in disgust, and Marsyas picks it up), and including vase scenes where Marsyas is shown not flayed but learning or even playing the lyre (rather than the aulos).<sup>27</sup> In ARV<sup>2</sup>, 19 vases after 450 B.C. show Apollo competing with his lyre against Marsyas and his aulos. No such scenes are recorded on red or black figure vases before 450. The different Marsyas myths mark off the aulos as an anti-lyre. 28 Wilson observes ("Aulos" 61) that after Myron's sculpture group on the Akropolis, anyone who took up the aulos implicitly aligned himself with Phrygian satyrs, even as Myron's work simultaneously incorporated the aulos "into the heart of civic life." In my unsystematic survey of 124 photographs of auloi on vases, after 450 no young men are shown being taught the aulos, and no

<sup>&</sup>lt;sup>26</sup> Some of these developments are briefly discussed by Schneider, *Flöte* 37, Huchzermeyer, *Aulos* 57–63, and B. Zimmermann, "Überlegungen zum sogenannten Pratinasfragment," *MH* 43 (1986) 152–153. Cf. Barker, *Musical Writings* I, pp. 93–98 ("The musical revolution of the later fifth century"), not however focused on the aulos.

<sup>&</sup>lt;sup>27</sup> See T. B. L. Webster, *The Greek Chorus* (London 1970) 132–133, J. Boardman, "Some Attic Fragments: Pot, Plaque, and Dithyramb," *JHS* 76 (1956) 18–20 (with further references), H. Metzger, *Les Représentations dans la céramique attique du V<sup>e</sup> siècle* (Paris 1951) 58–68, A. Stewart, *Greek Sculpture: An Exploration* (New Haven 1990) 147. See also Roscher, *Myth. Lex.* s.v. "Marsyas." Metzger notes that these Marsyas scenes were especially popular in the last quarter of the fifth century.

<sup>&</sup>lt;sup>28</sup> See also *LIMC* 6 (1992) 366–378.

bearded men are shown playing it, even at symposia (a not uncommon type of scene earlier).

As for literary evidence, Athenaeus (616e-617b) writes of Melanippides, a prominent dithyrambic poet (Xen. Mem. 1.4.3), music researcher, and member of the avant-garde sometime around or after mid-century:<sup>29</sup> "On the subject of auloi someone said that Melanippides had ridiculed aulos-playing splendidly in his Marsyas, when he said of Athena: 'Athena threw the instruments from her holy hand and said "Away, shameful things, defilers of my body! I do not give myself to ugliness"" (trans. Barker, Musical Writings I, p. 273). Barker suggests that despite Athenaeus's comment, this passage "need not be taken to represent Melanippides' own attitude to the aulos: he was, after all, composing for it, and the story of Athena and the auloi was a traditional subject positively begging to be set by a composer with a specialist knowledge of auletic techniques." Wilson points out the sense of paradox implicit in Athena's condemnation of the aulos which Melanippides set to the music of that instrument ("Aulos" 62–63). Such speculations are surely provocative. On the other hand, as we have seen, the rare Athena myth is attested first in 490 (Pyth. 12), and rather than a "traditional subject," may have been fairly novel when Melanippides wrote. Not only Athenaeus's source, with access to Melanippides' entire poem ("Melanippides had ridiculed . . .") but also Telestes, who was thought to have responded in defense of the aulos (see below), and the famous anecdote about Alcibiades which echoes this story (again below), imply hostility to the aulos.<sup>30</sup> Even though Melanippides was in part a dithyrambic poet, the fifth-century comic poet Pherecrates (ap. [Plut.] De mus. 1141d–1142a) associates him rather with research on stringed instruments, as the first to innovate with a twelve-stringed kithara. In Pherecrates' comedy, Music protests: "Melanippides started my troubles. He was the first of them: he grabbed me and pulled me down, and loosened me up with his twelve strings" (trans. Barker, ibid. 236). As Wilson himself notes ("Aulos" 65 n. 32), we do not know that Melanippides' Marsyas was a dithyramb.

<sup>&</sup>lt;sup>29</sup> Barker, *Musical Writings* I, p. 93, dates his activity ca. 480–430; West, *Greek Music* 357, ca. 440–415 (West's terminal date is presumably supplied by the destruction of Melos, Melanippides' native island).

<sup>&</sup>lt;sup>30</sup> For another rebuke to Athena for playing the auloi, see Plut. *De cohib. ir.* 456b, possibly from a satyr play by Euripides (and n. 20 above).

Furthermore, in his famous "hyporcheme" the poet "Pratinas" complains about aulos music: 32

τίς ὁ θόρυβος ὅδε; τί τάδε τὰ χορεύματα; τίς ὕβρις ἔμολεν ἐπὶ Διονυσιάδα πολυπάταγα θυμέλαν; ἐμὸς ἐμὸς ὁ Βρόμιος, ἐμὲ δεῖ κελαδεῖν, ἐμὲ δεῖ παταγεῖν ἀν' ὅρεα σύμενον μετὰ Ναϊάδων οἶά τε κύκνον ἄγοντα ποικιλόπτερον μέλος. τὰν ἀοιδὰν κατέστασε Πιερὶς βασίλειαν· ὁ δ' αὐλὸς ὕστερον χορευέτω· καὶ γάρ ἐσθ' ὑπηρέτας. κώμω μόνον θυραμάχοις τε πυγμαχίαισι νέων θέλοι παροίνων ἔμμεναι στρατηλάτας...

What is this noise? What are these dances?
What is this madness at the resounding altar of Dionysos?
Mine, mine is Bromios, it is for me to cry, for me to make the noise,
ranging the mountains with Naiads,
like a swan leading the many-feathered [winged?] tune.
The song the muse has made queen, let the pipe dance afterwards. For it is the servant.
It can only lead the revel and the street fights of young drunkards . . .

Roos (*Orchestik* 218–219) argued that "Pratinas"'s poem is not directed against the aulos but merely excessive aulos music in the worship of Dionysos. Yet the final lines of this passage are negative enough. Aulos music "can only lead the revel and the street fights of young drunkards." Although the date of this text has long been controversial, for metrical and other reasons Zimmermann has now convincingly

<sup>&</sup>lt;sup>31</sup> The quotation marks are to distinguish this poet from the earlier fifth-century Pratinas. See below.

<sup>&</sup>lt;sup>32</sup> Ath. 617b–f = Page *PMG* no. 708; trans. Picard-Cambridge, *Dithyramb* 17–18 (with minor changes). On the controversy over the genre of this poem, see Picard-Cambridge, ibid. 20; R. Seaford, "The 'Hyporchema' of Pratinas," *Maia* 29–30 (1977–1978) 84–94; and Zimmermann, "Pratinasfragment" 145–146. A. Barker, "*Heterophonia* and *Poikilia*: Accompaniments to Greek Melody," in *Mousike*. *Metrica ritmica e musica greca in memoria di Giovanni Comotti*, ed. B. Gentili and F. Perusino (Pisa and Rome 1995) 46–47, shows that in part "Pratinas" objects to the aulos playing heterophonic notes which are "obtrusively different from those proper to the melody."

defended the "low" dating (ca. 450–400) earlier proposed by Lloyd-Jones and accepted by Webster.<sup>33</sup> Before the revised chronology, most scholars thought that "Pratinas"'s poem was directed against the musical innovations especially of Lasos.<sup>34</sup> If this poem is rightly redated to the end of the period of the aulos revolution, however, "Pratinas"'s aim was probably directed more generally against those broader musical trends, and not primarily against Lasos who had helped to originate them several generations earlier.

From mid-century, music researchers at Athens turned from the aulos to stringed instruments. I have noted Pherecrates' joke about Melanippides' twelve strings. According to the scholiast to Aristophanes Clouds 970, Phrynis of Mytilene, who was awarded first prize at the first musical contest held in Pericles' Odeion (446?), was trained in aulodia but changed to the cithara. He is also said to have added extra strings to the cithara, and introduced "bendings," perhaps from one harmonia to another, in the scalar system. 35 Ps.-Plutarch writes (De mus. 1133b), "In general, the style of singing to the kithara employed by Terpander continued in a quite simple form down to the time of Phrynis." Toward the end of the century, both Timotheus of Miletus (who according to Arist. Met. 993c was Phrynis's student) and Philoxenus are also associated with stringed instruments having an unconventionally large number of strings.<sup>36</sup> Although Timotheus also wrote dithyrambs, he was associated especially with the kithara, as various texts (e.g., Macr. Sat. 5.22.4s = Loeb fr. 778) and his epitaph indicate. "Miletus was the fatherland that bore the delight of the Muses, Timotheus, the skillful driver of the kithara" (Steph. Byz. s.v. "Miletos" =

<sup>&</sup>lt;sup>33</sup> Zimmermann, "Pratinasfragment" 145–154, see also H. Lloyd-Jones, "Problems of Early Greek Tragedy: Pratinas and Phrynichus," *Cuadernos de la Fundación Pastor* 13 (1966) 16–18 (repr. with minor updates and changes in *Greek Epic, Lyric, and Tragedy. The Academic Papers of Sir Hugh Lloyd-Jones* [Oxford 1990] 227–230), Webster, *Chorus* 132–133. For the earlier dating see, e.g., Picard-Cambridge, *Dithyramb* 65–66.

<sup>&</sup>lt;sup>34</sup> See T. Bergk, *Griech. Literaturgesch.* 3 (Berlin 1884) 263, Schneider, *Flöte* 36, Picard-Cambridge, *Dithyramb* 17–20, Seaford, "Hyporchema" 81–84.

<sup>&</sup>lt;sup>35</sup> For his change from *aulodia*, see *Souda s.v.* Φρύνι. Victory in Panathenaia: schol. Ar. *Clouds* 971. Bendings: Ar. *Clouds* 971. Extra strings: Poll. 4.66, Plut. *Agis.* 10, Plut. *Inst. Lac.* 17, Ion fr. 3 B, Proclus *Chrest.* 320a. See also Barker, *Musical Writings* I, p. 94.

<sup>&</sup>lt;sup>36</sup> For Phrynis, see also *Souda s.v.*; for Timotheus, see Ion fr. 6 = I 70 D. ("The Eleven-String Lyre"), Pherecrates' *Chiron* (quoted below), Ath. 636e, Plut. *Inst. Lac.* 238c-d, Paus. 3.12.10. For Philoxenus, see Barker, *Musical Writings* I, pp. 94-95.

Loeb fr. 5). A speciality of this later period was imitating the sounds of the aulos on stringed instruments (Pl. Laws 700).

As a further aspect of these developments, in Athens during the second half of the fifth century the role of the aulos in upper-class education notably weakened. In our sources this development is associated especially with Alcibiades (b. ca. 450), who like Athena is said to have rejected the instrument because it made him look ugly. In (ps.-?)Plato Alcibiades I 106e, Sokrates says that Alcibiades had learned writing, kithara playing, and wrestling, "but didn't want to learn aulos playing." According to Plutarch (Alc. 2), after Alcibiades made fun of the aulos and anyone who learned it, "he emancipated himself from this discipline, along with the rest of the boys . . . In consequence the aulos disappeared from the pastimes of free men, and came to be utterly despised." Pamphila's report (in Gell. 15.17) is similar.

Finally, despite the extraordinary prominence of the dithyramb in Athenian public life, especially during the Great Dionysia when 1,000 Athenian men and boys performed tribal dithyrambs in groups of fifty, very few of the composers of these dithyrambs were Athenian natives (Wilson, "Aulos," 63 and n. 20).

On the other hand, aversion to the aulos was not uniform, either among the poetic elite or among Athens' upper classes. Telestes of Selinus, who at least competed at Athens (winning the dithyrambic prize in 402/1: *Marm. Par.* 79), was thought to have countered Melanippides in defense of the aulos.<sup>38</sup> Following his discussion of Melanippides' poem, Athenaeus continues (616e–617b, trans. Barker):

Someone else responded by saying "But Telestes of Selinus hit back at Melanippides in his *Argo*: speaking of Athena he said: 'When the clever goddess had picked up the clever instrument in the mountain thickets, I cannot believe in my mind that she, divine Athena, frightened by the ugliness unpleasant to the eye, threw it away again from her hands to be a glory to Marsyas, that handclapping creature born of a nymph. Why would sharp passion for love-inducing beauty have worried her, to whom Clotho had allotted

<sup>&</sup>lt;sup>37</sup> By contrast, according to Athenaeus 184d citing Duris, the Theban Pronomus taught Alcibiades the aulos. Wilson ("Aulos" 89) notes that Alcibiades' rejection of the aulos is assigned to his youth.

<sup>&</sup>lt;sup>38</sup> Wilson ("Aulos" 65) defends the chronological possibility that Telestes directly responded to Melanippides in a text performed before the Athenian demos.

virginity, marriageless and childless?' (He means that she would not have sought to avoid ugliness in her appearance because of her virginity.) . . . Afterwards he extols the art of the aulos, saying: 'Which the uplifted breath<sup>39</sup> of the noble goddess, with the swiftness of her quivering-winged hands, passed on to Dionysos to be his best helper.' In the *Asclepius*, too, Telestes ornately expressed the use of the auloi.

Telestes himself was a musical radical (Barker, *Musical Writings* I, p. 97). In Aristophanes' *Daitales* (fr. 221 K. = 232 K.-A.), learning to play both aulos and lyre is a symbol of a clever new education. According to Chamaeleon (ap. Ath. 184d = fr. 3 Wehrli), both Callias the son of Hipponicus (b. ca. 450) and Critias the son of Callaeschrus (b. ca. 460) played the aulos. Xenophon (*Mem.* 1.2.27) implies that in some form at least, the aulos continued to be taught. According to Strabo (1.2.3), Aristoxenus and others commended instruction in both the aulos and the lyre for their ability to shape character. Although my informal survey of vase paintings after 450 showed no young men learning the aulos or bearded men playing it, several vases now depict respectable women playing that instrument, in domestic settings.

In contexts other than research, poetic exposition, and musical education among certain elite citizens, the aulos continued to occupy a central position in Attic society, especially as an accompaniment for dithyrambic and dramatic performances and at sacrifices. Oliver Taplin has called attention to the ever more splendid, full-length robes of auletai on vase paintings, especially for Athens' great public competitions. As we have seen, from the time of "Pratinas's hyporcheme" the music of the aulos could take precedence over poetic texts. Prizes in aulos competitions were fewer in number and lower in value than those for the kithara, and the players themselves were almost invariably for-

<sup>&</sup>lt;sup>39</sup> On the text, see G. Comotti, "Atena e gli *auloi* in un ditirambo di Teleste," *QUCC* 5 (1980) 47–54.

<sup>&</sup>lt;sup>40</sup> O. Taplin, Comic Angels and Other Approaches to Greek Drama through Vase-Paintings (Oxford 1993) 70–71.

<sup>&</sup>lt;sup>41</sup> See [Plut.] *De mus.* 1141d (the mention of Melanippides is judged to be an interpolation: Pickard-Cambridge, *Dithyramb* 18–19 followed by Seaford, "Hyporchema," see also Weil and Reinach's edition of *De musica*), Ath. 617b–f, and Pickard-Cambridge ibid. 55. For the aulos in sacrifice, see J. Haldane, "Musical Instruments in Greek Worship," *G&R* 13 (1966) 98–107.

<sup>&</sup>lt;sup>42</sup> See *IG* II<sup>2</sup> 2311.20–22.

eigners or slaves—"Athenians are virtually invisible" (Wilson, "Aulos" 70). Yet many sources attest the aulos's enduring popularity, especially in popular contexts.

The Greeks themselves offered a variety of explanations for the diminished appeal of the aulos after 450, at least in certain elite contexts. As the final lines of "Pratinas's hyporcheme" indicate, elite controversy over this instrument may in part have resulted from its powerful emotional effects, especially apparent at funerals and weddings, in symposia where auletrides were a regular feature, and in tragedies and dithyrambic performances (see Wilson, "Aulos" 74–76). In a Bacchic context Sophocles' chorus proclaims ἀείρομαι οὐδ' ἀπώσομαι τὸν αὐλόν, ὧ τύραννε τᾶς ἐμᾶς φρενός (Trach. 216–217). In Euripides' Herakles the aulos is the instrument of madness (871, 879, 897).<sup>43</sup> According to the comic poet Phrynichus (fr. 67 K.-A.), auletes were associated with great sybariasmos.<sup>44</sup> In the next century Plato banned the aulos from both of his ideal states (Resp. 399d, Leg. 669, 700). For Plato, the lyre was a steady and traditional instrument suitable for preserving the traditional harmoniai, but the aulos was capable of musical revolution, mixing harmoniai, producing strange noises, and destroying the balance of voice and instrument. In Symp. 215b-c, Socrates observes that "Marsyas had only to put his aulos to his lips to bewitch mankind—which still can be done by anyone who can play the tunes he used to play . . . Whoever plays them, from an absolute virtuoso to a twopenny-halfpenny auletris, the tunes will still have a magic power" (trans. M. Joyce). Aristotle concludes his brief history of the aulos with the myth of Athena throwing away the aulos. "It may well be ... that the goddess did this because she disliked the facial distortion . . . But a far more likely reason is that an education in playing upon the pipes contributes nothing to the intellect." Intellectual or philosophical objections to the aulos continued down through antiquity. Athenaeus quotes an epigram, "in an aulete the gods implanted no sense [noos], / for together with his blowing, his sense [noos] also flies away" (337e-f). In his *Life of Pythagoras* (111) Iamblichus states that the Pythagoreans used the lyre "because Pythagoras thought the aulos had an assertive tone, suited to large gatherings but not to cultivated people." Aristides Quintilianus quotes Iamblichus as counselling his

<sup>&</sup>lt;sup>43</sup> For the aulos in tragedy, see above all part 3 of Wilson's "Aulos."

<sup>&</sup>lt;sup>44</sup> For the sounds and emotional effects of the aulos, see West, *Greek Music* 105–106.

students to avoid hearing the sound of the aulos, as something "staining" the spirit. The lyre chases away the irrational desires of the soul.<sup>45</sup>

Several other factors will also have worked against the aulos. First as we have seen, the aulos was typically associated with Boeotia, which had especially complicated political relations with Athens at midcentury. In 457 the Boeotians and Spartans defeated the Athenians at Tanagra. Two months later the Athenians returned to defeat the Boeotians at Oenophyta. Athens henceforth dominated its hated neighbor (dramatists represented Thebes as an "anti-Athens"<sup>46</sup>) until a major military defeat at Coronea in 446. Thebes was always famous for its auletes.<sup>47</sup> Although extant sources do not mention this explanation, mid-century would be a good time to reject the "Boeotian" instrument.<sup>48</sup>

Second, the growing complexities of music will have limited the aulos's role in citizens' social playing, especially because it is much more difficult to play notes precisely on the aulos than on stringed instruments.<sup>49</sup> The difficulty and complexity of aulos playing are specifically noted by Theophrastus (*Hist. Pl.* 4.11.4–5) and later by Lucian (*Harmonid.* 1). Equally important, mastering the requisite skills to produce good music on the aulos put one at risk of becoming banausic, a "mechanic." Isocrates is said to have been ridiculed by Aristophanes and Strattis as an "aulos-borer" (Strattis fr. 3 K.-A., cf. K.-A.'s numerous testimonia), supposedly because his father owned an aulos factory (Plut. *Mor.* 836e). Philostratos (*Vit. Soph.* 1.17.4) defended Isocrates as knowing nothing of auloi or anything else *en banausiois*. Aristotle questions at length how far it is proper for *eleutheroi* to learn

<sup>&</sup>lt;sup>45</sup> See Aristid. Quint. 91.27–92.3 W.-I., Iambl. *De myst.* 3.9, and contrast Ath. 184e. Plutarch tells of a party he attended that got seriously out of control because of aulos music (*Quaest. Conv.* 704c–706e).

<sup>&</sup>lt;sup>46</sup> See F. Zeitlin, "Thebes: Theater of Self and Society in Athenian Drama," in *Nothing to Do with Dionysos? Athenian Drama in its Social Context*, ed. J. Winkler and F. Zeitlin (Princeton 1990) esp. 144–150.

<sup>&</sup>lt;sup>47</sup> See Chameleon and Aristoxenus ap. Ath. 184d–e (and also Nepos *Epam*. 2.1), Maximus of Tyre, *Philos*. 17.2 (Θηβαῖοι αὐλητικὴν ἐπιτηδεύουσιν καὶ ἐστὶν ἡ δι' αὐλῶν μοῦσα ἐπιχώριος τοῖς Βοιωτοῖς); Dio Chrys. *Or.* 7.121; *Anth. Pal.* 3.8; Huchzermeyer, *Aulos* 47–48. The schools of Pronomus, Antigenidas, and Dorion, all Thebans, were famous (see Barker, *Musical Writings* I, p. 97).

<sup>&</sup>lt;sup>48</sup> See I. Kasper-Butz, Die Göttin Athena im klassischen Athen: Athena als Repräsentantin des demokratischen Staates (Frankfurt a. M. 1990) 184.

<sup>&</sup>lt;sup>49</sup> See West, *Greek Music* 94–96.

to play any kind of music (Pol. 1340b20-1341b18). He argues that music must not be studied to a high level of competence, for this would make the performer a banausos and thus interfere with his citizen's arete. "In fact," he says, "we call music performers banausoi, and think that a man should not perform except for his own amusement or when he has had a good deal to drink" (Pol. 1339b9-10, trans. Sinclair and Saunders). According to Plutarch (Per. 1), when Antisthenes the Socratic heard that the Theban Ismenias was an excellent aulos player, he remarked, "yes, but he's a base man; for otherwise he wouldn't be a serious aulos-player."50 Plutarch also reports that when Philip II of Macedon was asked which of two aulos players was the better, he replied, "Polyperchon is the better general" (Pyrrh 8.7). Plutarch has a favorite anecdote about an argument between Philip and a lyre-player, who remarked, "I hope you won't be in such a bad way, king, that you would know more about this than I do."51 From the later fifth century on, music performance was increasingly in the hands of professionals.<sup>52</sup>

The vagaries involved in playing the aulos (in comparison with stringed instruments) also limited its appeal for music researchers. In *Philebus* 56a, Socrates condemns the aulos because it is impossible to hit notes precisely, rather than by "the luck of a practiced finger." The fourth-century music theoretician Aristoxenus (*Elem. Harm.* 43.14 Meib.) condemned the aulos for the imprecision of its notes, as providing no basis for formulating the laws of harmonics. According to Athenaeus 174e, he also claimed that it was too easy for the untaught to play the aulos or syrinx, like shepherds.

Finally, as other periods illustrate, shifts in musical fashion may be influenced by comparatively trivial or serendipitous events, the evolution of taste, or simply the search for fresh or innovative means of expression. In other matters too, constant innovation was an Athenian characteristic.

<sup>&</sup>lt;sup>50</sup> Compare Plut. *De Alex. fort.* 334b: Ismenias played before the Scythian king who rudely and ignorantly swore that his own horses sounded better—presumably when farting.

<sup>&</sup>lt;sup>51</sup> De adul. et amic. 67f, Reg. et imp. apophtheg. 179b, De Alex. fort. 334c-d, Symp. 634c-d.

<sup>&</sup>lt;sup>52</sup> See R. W. Wallace, "Speech, song and text, public and private. Evolutions in communications media and fora in fourth-century Athens," in *Die athenische Demokratie im 4. Jahrhundert v. Chr. Vollendung oder Verfall einer Verfassungsform?*, ed. W. Eder (Stuttgart 1995) 210–212.

With the notable exceptions of Thebes,<sup>53</sup> Alexandria (Ath. 176e-f), and Sparta, the unfashionability of the aulos at least in some elite circles spread throughout the Greek and Roman worlds. Cicero remarks, "as they say of Greek musicians, those who cannot become citharodes are aulodes" (*Mur.* 13.29). Athenaeus observes that "to all Greeks in the old days" music was of such concern that they even showed enthusiasm for the aulos (184d). Pamphila notes (we have seen) that aulos playing in fifth-century Athens was *then* considered *honestissimum*. Ptolemy XII's cognomen "auletes" (Strab. 795, Plut. *De adul.* 56f) was not meant as a compliment.

Outside elite circles, however, in the traditional contexts of theater, dithyramb, and cult, and especially in the post-Classical periods, the aulos continued to be much enjoyed. According to [Aristotle] *Problemata* 19.43, musical solos were more pleasant if sung to the aulos than to the lyre. According to Theopompus (ap. Ath. 435b, see also 338b), Philip of Macedon kept the aulete Dorion constantly by him. At *Quaes. Conv.* 712f–713b, Plutarch pays glowing tribute to aulos music at the symposion — despite its dangerous potential (see n. 45). Reinach documents the fame of traveling auletes during the Hellenistic and Roman periods, and the ongoing importance of the aulos in cult.<sup>54</sup> In non-Athenian contexts, musical research and experimentation with the aulos also continued. The Theban Pronomus (ca. 400) is credited with devising auloi on which several different *harmoniai* could be played, presumably by means of rotating collars to block or open holes.<sup>55</sup>

If Phrynichus was right to assign a line in *Clouds* to the aulete Lamprocles, the phenomenon is not unparalleled that within two generations a musical innovator should come to be regarded (by *Dikaios Logos*) as a pillar of the old order. In Aristophanes' time the great musical villain was Timotheus of Miletus, who openly boasted of his new music (fr. 796 Page). When Pherecrates "put Music on the stage in the guise of a woman, her whole body displaying signs of ill-treat-

<sup>&</sup>lt;sup>53</sup> See, e.g., G. F. Brussich, "Un auleta del IV sec. a C.: Timoteo di Tebe," in *Mousike*, ed. Gentili and Perusino, 145–155.

<sup>&</sup>lt;sup>54</sup> T. Reinach, s.v. "tibia," in Daremberg and Saglio, *Dict. antiq.* 5, 321–322, 329.

<sup>&</sup>lt;sup>55</sup> Paus. 9.12.5, cf. Ath. 631e, and see West, *Greek Music* 87.

<sup>&</sup>lt;sup>56</sup> On the disappearance of early fifth-century classics by the end of the century, see G. Nagy, *Pindar's Homer* (Baltimore 1990) 107–108, 112–115.

<sup>&</sup>lt;sup>57</sup> On Timotheus, see Barker, *Musical Writings* I, 95–97; for the passage from Pherecrates' *Chiron*, see D. Restani, "Il 'Chirone' di Ferecrate e la 'nuova' musica greca. Ricerca sul lessico retorico-musicale," *Riv. Ital. Musicol.* 18 (1983) 139–192.

ment," Music complained to Justice bitterly enough about Melanippides, Cinesias and Phrynis—"but Timotheus is another matter. My dear, he's buried me in a hole and scraped me all away—it's awful!" [Justice] asks] "Who is this Timotheus?" [Music replies] "He's a red-head from Miletus. The things he did to me were worse than all the others put together, with those perverted ant-crawlings he went in for.<sup>58</sup> And when he found me out for a walk by myself, he untied me and undid me with his twelve strings" ([Plut.] De mus. 1141d–1142a, trans. Barker). Yet by the later fourth century, Timotheus had come to be regarded as Athens' most important lyric poet (Arist. Met. 993b). Plutarch (Phil. 11) reports that when Philopoemen entered the theatre at Mantinea, the citharist brought down the house with the first line of Timotheus's Persae. The Cnossians and the people of Priansos praise a visiting musician for performing the compositions of Timotheus, of his disciple Polyidos, and also "of old Crete," "beautifully and as befits an educated man," on the cithara.<sup>59</sup> Polybius (4.20.6–9) attributes the strength of character and discipline displayed by contemporary Arcadians to their constant instruction in the music of Timotheus and Philoxenus. Athens' late fifth-century musical revolutionaries ended as inspirational classics in rural Arcadia. The present essay has aimed to shed light on the leaders of an earlier, more obscure revolution: Lasos, Pythocleides, Agathokles, and Pindar. Among these great figures in early fifth-century Greek musical experimentation we may now include Lamprocles "the aulete," notwithstanding his later relegation by Dikaios Logos to Marathonian respectability.

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<sup>&</sup>lt;sup>58</sup> On "ant-crawlings" associated with Agathon and new music, see Ar. *Thesm.* 100 and Barker, *Musical Writings* I, 95 and 109 n. 39. Barker explains these as "quick, decorative figures, intricately meandering." According to the *Souda* (s.v.), Philoxenus was called "ant."

<sup>&</sup>lt;sup>59</sup> For Cnossos, see *IC* I 8.11 (p. 66) = *CIG* 3053 (post a. circ. 170 [a. C.] factum: Guarducci); for Priansos, see *IC* I 24.1 (pp. 280–281).



Reconstructing the Greek Tortoise-Shell Lyre

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# Reconstructing the Greek tortoise-shell lyre

Helen Roberts

Undoubtedly the oldest description of the Greek tortoise-shell lyre or lyra is found in one of the Homeric Hymns dating from not much later than the seventh century B.C. According to this story Hermes scooped out the marrow of a mountain tortoise with a scoop of grey iron. He cut stalks of reed to measure and fixed them, fastening their ends across the back and through the shell of the tortoise and then stretched ox hide all over it. Hermes also put in the horns and fixed a cross piece upon two of them and stretched seven strings of sheep gut which he then sounded with a plectrum (Homeric Hymn to Hermes, 31–53).

We gather from Pausanias (8.54.7) that the tortoise most suitable for the construction of the lyre was found on Mount Parthenius in Arcadia. This was the larger variety of Greek tortoise, the *Testudo marginata*, which grows to a length of 220–300 mm., unlike the more commonplace *Testudo graeca* which is much smaller.

Unfortunately, as tortoise-shell is a perishable material, nearly all the ancient lyre soundboxes have corroded away. The fragments of perhaps only three have survived and are preserved in the museums of London, Argos and Reggio. The fragment in the British Museum (plate 69) was found in a tomb near Athens together with the wooden arms and crossbar of a lyre. As so little of the tortoise-shell remains, no attempt has been made to use it in a reconstruction. It is currently displayed alongside a plaster cast of a similar tortoise-shell, which is roughly 300 mm. long. Two carapaces were found at Argos, although only one of these has been used in a rather dubious reconstruction of a lyra. The shell was in fragments, which have been pieced together and little, if any, of the original contour of the soundbox remains. The bright fawn fragments have been stuck on to a modern basis of dark brown tortoise-shell which is approximately 230-260 mm. long (fig. 1). As the maximum length of the surviving fragments is 170-200 mm. we may perhaps assume that the larger Testudo marginata formed the soundbox of the lyra. The Reggio tortoise-shell (plate 70) dating from the early fifth century B.C., is the most complete. The carapace is very long, upwards of 300 mm. and the contour of the soundbox has remained virtually intact.

As the larger variety of Greek tortoise, the *Testudo marginata* is not available in British pet-shops, a tortoise from Southern Russia had to be substituted. Although this species has different shell markings it has the same contour as the *Testudo marginata* 

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and grows to roughly the same length. The tortoise-shell used in the reconstruction is 230 mm. The Zoology Department of Reading University kindly agreed to remove the body of the reptile from its shell. After the carcase had been boiled for several hours, the internal matter flowed freely out of the exits in the upper and lower armour-like coating

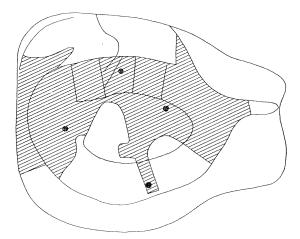


Figure 1 Sketch of tortoise-shell soundbox (Argos Museum). (Shaded sections original)

of the reptile. The familiar spangled upper shell continues for an inch below the tortoise between the exits for the feet. Fortunately this lower section of the carapace, which the Greeks may have put to good use, as we shall discuss below, was not removed although the plain horn-like substance covering the base of the reptile was.

The arms were modelled on those of the Elgin lyre in the British Museum, (plate 71), which are made of sycamore. How were the arms fitted within the shell? Contemporary pictorial evidence gives no indication (cf. Wegner 1963: Abb 55–9), and there are only two possible literary references to the internal structure of the soundbox. When the empty tortoise-shell was studied, a ledge could be seen immediately below the exit for the reptile's head (plate 72). Obviously this could form a natural ledge for the bottom of the arms, since the carapace was turned upside down on the lyra. The arms probably continued to curve inwards below the shell until they eventually coincided, forming a common base, which rested upon the ledge; this would also have had the effect of stabilizing and strengthening the whole structure. The advantage of leaving the carapace intact below the shell, between the exits for the legs, soon became apparent. The arms could then be very conveniently supported against the lower end of each projection of the carapace in the space reserved for the tortoise's rear legs.

In the construction of the arms we employed in the main only the techniques known to the Greeks. As the Elgin lyre arms were made of sycamore, we purchased a well seasoned quantity of the same timber. Although practically nothing is known about the seasoning methods used by the ancient Greeks, the very survival of the Elgin lyre is a testimony to the efficiency of the ancient processes.

We know that the Greek lyre makers used the lathe in their work, since Aristophanes

(Birds, 491) coins the comical word torneutolyraspidopegos, 'lyre turner and shield maker'. It is true that no specimen of an ancient lathe (Singer et al. 1957: 232) has come down to us, but we may reasonably surmise that it could only be utilized for shaping cylindrical pieces of timber. Nevertheless, the Elgin lyre arms, like those in sculptures and reliefs, have a flat surface, only the very base of the arm being at all cylindrical. The lathe must therefore have been used for other parts of the lyre with a cylindrical shape, such as the crossbar, pegs and – probably – tailpiece.

The Greeks knew how to bend wood artificially, for Theophrastus (Inquiry into Plants, 5.7.6) states that most tough woods are easy to bend. The lyre arms may therefore have been bent perhaps by steaming, or, alternatively, have been cut out of two blocks of wood. Unless he used tortoise-shells of a uniform length, the Greek lyre-maker would have had to make slight adjustments to his template for each instrument; this is because the lower section of the lyre arms would have varied in length according to the dimensions of each tortoise-shell. The bases of the arms may have been joined together and placed on a ledge inside the tortoise-shell for the above mentioned reasons. It was especially important for the arms to fit snugly under the lip of the projecting carapace. In the Reading experiment it was decided to cut the arms out of two blocks of wood as this was a less time consuming method in our opinion. At this stage they had a uniform thickness of one and a quarter inches so that the bracket for the crossbar could be carved out of them. The top 90 mm., i.e. the part which projects above the crossbar, was then sawn to a thickness of 10 mm. and a groove, almost 25 mm. and 8 mm. wide was inserted in the arm immediately below. The bracket having been made, the rest of the arm was subsequently thinned down with a file or chisel (both tools being known to the Greeks). The other arm of course had to match. Next, the projecting line in the centre of the arm was added. Lines about 4 mm. apart were marked in pencil along which cuts were later made with a sharp knife to a depth of c. 2 mm. In antiquity the arms and indeed other wooden parts of the lyres may have been polished with oil of juniper or cedar mixed with beeswax (Singer et al. 1957: 234).

It seemed sensible to give each arm a vertical base so that when glued together, they would form a level reasonably stable foundation for the whole structure; glue was certainly used in Greek carpentry. Nevertheless, a peg was later inserted through the vertical bases of the arms primarily in order to strengthen the joint, but it also proved a convenient anchor for the tail gut.

The Greeks very probably turned the crossbar on the lathe, tapering it slightly at either end. It would, however, have been easier to fit the crossbar into the bracket whilst the wood was still a square shape. Slots may therefore have been inserted in the front and back of the crossbar before it was turned. In an attempt to copy the Elgin lyre fragments as closely as possible, the crossbar was constructed out of sycamore. The strings were then tied around sycamore pegs and the crossbar in such a way that a pull on the peg tightened or loosened the string. After a few days, however, the strings had cut into the crossbar and indentations appeared on the side of the peg in contact with the crossbar. Obviously the crossbar and pegs should have been made of a harder wood, hence the significance of Theophrastus' (*Inquiry into Plants*, 5.7.6) remark about *kermes* oak being used for the crossbars of lyres, psalteries and the axles of wheelbarrows.

Let us now discuss the tuning mechanism of the lyra in more detail. We know that a

tuning mechanism existed in the time of Homer, for he mentions the kollops of the phorminx (Odyssey, 21, 406-9). The Archbishop Eustathius, admittedly a late source, discusses the type of kollops used on Odysseus' phorminx and quotes the explanations of other more ancient lexicographers. Apparently tough hide from the necks of oxen and sheep were used for the kollops. This hide, from which glue (kolla) was made, is itself called kollops, and, as one of Eustathius' authorities assures us, some of the animal fat was left on the skin. For each string a strip of sticky hide was wrapped around the yoke, and after a few turns the string was included, the roll being turned so that the string went diagonally across itself (fig. 2). The whole roll of hide and string was turned in one piece to alter string tension. The kollops was thereafter compressed in the desired position



Figure 2 Sketch of string twisted diagonally across itself when attached to primitive tuning peg

thus keeping the string taut; it might, however, have needed replacing when the animal fat dried up, and the hide no longer adhered to the crossbar and string. The same tuning mechanism is still in use today on the kissar, a primitive lyre type instrument found in East Africa and Abyssinia.

The fourteenth of the *Mechanical Problems* attributed to Pseudo-Aristotle deals with the principle of leverage. The question posed is why big *kollopes* are easier to wind around one and the same crossbar than smaller ones. Unfortunately Aristotle gives the wrong explanation; namely that the crossbar constitutes the centre of a circle, and the same force winds a big circle more easily than a small one. The real significance of the passage, however, is its indications that the *kollopes* moved around the crossbar as a centre and the longer they were, the greater the leverage and the easier they were to turn. Certainly the primitive tuning device mentioned by Eustathius in his commentary on the *Odyssey* makes no sense in this context. The *kollopes* to which pseudo-Aristotle refers in this problem are handles or levers.

It is very likely, then, that the early Greeks used a tuning device which was not only inconvenient but also unclean. New lumps of ox or sheep hide would no doubt have been needed whenever the instrument was restrung; Odysseus himself fixes his string to a new kollops (Homer Odyssey, 21 406). These lumps of animal hide would inevitably have been rather bulky and cover much of the surface of the crossbar. The thick undulating crossbar found on many black-figure vases (e.g. British Museum B46, B195) surely fits this description admirably. No wonder this crude tuning device was already being replaced in the sixth century by a more satisfactory arrangement in the form of seven roughly oblong pegs – obviously the type of kollopes Aristotle had in mind.

In vase paintings the pegs are always in the same position, i.e. parallel to the crossbar, although they could of course have been rotated around the whole circumference (fig. 3). The vase painter does not reproduce a true picture of what he saw before him. The lyre pegs must have rested at different angles to the crossbar, as none of the strings was tuned to the same pitch. Such objectivity would, however, have made almost

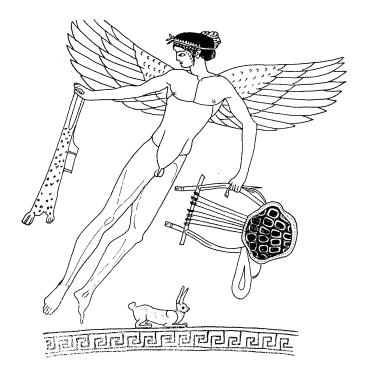


Figure 3 Detail of vase no. 85049, National Museum, Naples

impossible demands upon the Greek painter's technique; moreover, the symmetrical placing of the pegs was not only convenient, it was also more appealing to the Greek eye.

If the pegs were rotated around the circumference of the crossbar, obviously from the back view only the top and bottom of the peg would be seen projecting beyond either side of the yoke. This is the simple explanation of the rings or dots on the edges of the crossbar on a number of vase paintings – they are the rear side of the oblong pegs (fig. 4).

Were these tuning mechanisms invented by the Greeks? Probably not. Remains of nine Sumerian lyres were found at Ur two of which can be identified with certainty as eleven stringed lyres dating from the third millennium B.C. Although the basic wooden structure of one silver lyre (BM 121199) had disintegrated, the silver sheaths of the sticks or levers by means of which the string tension was altered and the instrument tuned, had survived (Rimmer 1969: 14–15; Barnett 1969; esp. 103). The lever method, which is still used on the Ethiopian kerar and baganna, was no doubt much easier to manipulate than the greasy roll of animal hide. Until an ancient Greek lyre peg is actually unearthed, we shall probably never know exactly how the Greeks attached the string to this wooden lever. Two possibilities suggest themselves; either the string was knotted through a

small perforation such as exists on the silver sheaths of the Sumerian lyres, or the string was simply tied round the whole circumference of the peg; the latter method was adopted, merely for the sake of greater convenience, in the reconstructions. The string can then

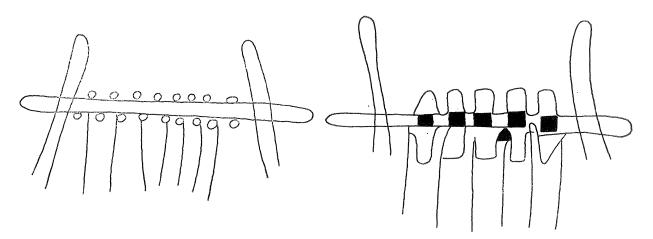


Figure 4 Sketches of pegs illustrated on red-figure vases (British Museum, inv. nos. E453 and E301)

be wound around the yoke and stick in such a way that a pull on the stick tightens or loosens the strings; fig. 5 illustrates this method.

Strangely enough, the Sumerians also seem to have progressed to this more efficient lever method from a crude tuning device similar to that of the early Greeks. Rimmer (1969: 15) believes that the other eleven stringed silver lyre from Ur, of which only the yoke and one arm survives, may have been tuned by the primitive roll method – the yoke carries eleven thickish impressions where the strings were fixed, and no stick sheaths or sticks were found.

There is another thorny question. What was the donax hypolyrios, literally 'the reed which went under the lyre', to which Sophocles (frag. 36) and Aristophanes (Frogs, 231ff.) both refer? According to the Scholiast on Aristophanes the donax hypolyrios is to be understood as a reed (kalamos) which in olden times was placed under the lyre instead of horn; the habit remained and the horn which later replaced the kalamos was also called reed. The Scholiast then quotes a fragment of Sophocles' The Captive Women from which we gather that the removal of this reed would have put the player in a distressing dilemma. The only literary reference to a reed fixed inside the soundbox occurs in the Homeric Hymn already cited. The relevant lines are as follows; 'He cut stalks of reed to measure and fixed them, thrusting them across the back and through the shell of the tortoise' (Hymn to Hermes, 47-8). Can this then be the explanation of some of the holes in the Argos and Reggio tortoise-shells? Why, however, was such a framework of reed necessary in the first instance? The only hypothesis which offered itself at this stage of the reconstruction was that the reed, and later horn, served the purpose of fixing the arms completely rigidly within the soundbox. The position for a horn crosspiece was obvious; beneath the middle of the lower lips of the tortoise-shell two little grooves are clearly visible in the carapace into which a horn crosspiece could be inserted. Red deer antler was used in the Reading reconstruction, although the Greeks may well have used ox horn.

After some handling and playing the horn crosspiece became dislodged and began to rattle around inside the soundbox. The arms stayed in position, although the drumskin, which had hitherto remained taut, became loose and flabby. The shape of the tortoise-shell had changed under the strain of the tightened strings; without the horn crosspiece

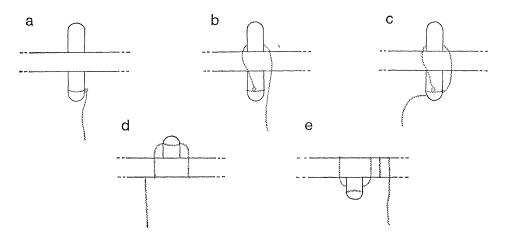


Figure 5 Method of string tightening on the ancient Greek lyre

to buttress its sides, it had become elongated and would eventually have buckled under the longitudinal pressure. A worse disaster can hardly be imagined, for, in order to refix the crosspiece, it proved necessary to dismantle the entire instrument. Sophocles' simile just referred to is indeed vivid and evocative of a terrible catastrophe!

The skin was removed and holes were then drilled through the horn crosspieces so that it could be pegged to the arms below (plate 73). Fixed in this manner, the reconstruction has withstood any amount of subsequent rigorous handling.

Hermes, according to legend, covered the lyre soundbox with ox-hide, although other types of skin may also have been suitable. The implication is that Hermes used raw ox-hide on his instrument which raises the question of whether tanned skins were later fitted around the soundbox. There is no certain evidence and once again we must resort to conjecture. In the late seventh and early sixth centuries before tanning had become a specialized job, the lyre-maker may have attempted to cure his own skins, although he very probably found it more convenient to use raw hide. There is evidence, though, of increasing dissatisfaction with the crude instrument during the sixth century; in black figure vase paintings, wooden arms supplant animal horns, wooden pegs replace greasy rolls of hide, and probably tanned hide replaced raw hide as part of the same process. Hesiod (5.450) does not yet mention tanning when he tells us that fur dresses and boots were made of goat skins and dressed with sinews, but he is, of course, talking about country folk. The dressing of these pelts was very primitive – hence the expression 'stinking Locrians' in ancient literature (Pausanias 10.38.3). The urbane fifth-century

Athenian gentleman would certainly have found the stench of raw hide repugnant especially at the intimate social gatherings where music was frequently heard.

For the present experiment some of the thickest drumskins on the market were purchased, in the belief that the Greeks would have been unable to produce a tanned skin as thin as any modern drumheads. Surprisingly, it was subsequently discovered that even now animal drumskins are still only properly prepared by hand, with a currier's knife, a very ancient tool known to the ancient Greeks, for Aristophanes mentions that the hide is stretched and scraped on the beam (Singer et al. 1957: 157). Raw ox-hide must have been approximately 6 mm. thick; would, then, the use of tanned thinner skins have changed or improved the sound of the lyre? Drumskins of varying thicknesses were experimented with and it was concluded that, provided the skin was taut, skin of almost any thickness would serve. Since, however, raw hide does not remain as taut as dressed hide, the tone of the instrument may well have improved with the use of the latter material.

As skins are more workable when wet, I left my drumskin in cold water for ten minutes – in accordance with the practice of modern drummers – before fitting it over the soundbox. The skin must have overlapped the rear of the lyre thus forming a rim around the tortoise-shell. Can we interpret the dots on the rim of the soundbox in certain vase paintings (plate 74) as stitches which have been sewn around the edge of the skin in order to keep it in position? A similar method of attaching skin to a tortoise-shell resonator can be found today on the primitive North African gnbri. On this instrument the stitches run parallel with the contour of the carapace so that when either end of the thread is pulled tight the skin is gathered up and stretches taut over the soundbox. There may, however, be an alternative explanation of these dots or circles because similar holes punctuate the original circumference of the Reggio tortoise-shell at regular intervals except where it has been restored (plate 70). Perhaps pegs and glue similar to those found on a modern lyre-type instrument, the kora, were also used. The Greeks may then have had more than one method of fixing the skin. It was decided to stitch rather than peg the skin of my lyre as this seemed the easier method.

The tailpiece of the lyre is illustrated as a straight line in the vase paintings. The supports of the tailpiece vary in shape as though made of some flexible material such as gut. Since there is no indication of how these supports were attached to the tailpiece, a cylindrical piece of sycamore (with a circumference of 8 mm. and length of 90 mm.) was made with a groove on the upper side; two holes were then drilled through the sycamore at either end of the groove. The gut was laid in the groove, threaded through the holes and finally looped through the twine stitches on the rim of the skin.

Now it became necessary to question the idea of slotting tailgut through the twine stitches on the skin. It was clear that the tailgut would rapidly cut through the twine under the pressure of the tightened strings. Upon studying the Reggio tortoise-shell for clues, it was observed that there were two roughly hewn holes on either side of a central scale, near what would have been the base of the soundbox (plate 70). Perhaps the tortoise-shell had decayed at these points, for the holes certainly do not seem to have been carefully drilled like most of the other perforations on the shell. Nevertheless, in view of the symmetrical placing of the holes one may perhaps be forgiven for explaining them as perforations made so that the tailgut could be attached within the soundbox.

After drilling two holes in comparable positions on the soundbox, we threaded the tailgut through them attaching the ends to either side of a peg driven through the base of the arms (plates 72 and 73).

When the lyre strings were brought up to pitch (Roberts 1974: Ch. 5) the tailpiece withstood the strain, but after twenty-four hours it was buckling upwards and it was soon obvious that a stronger wood should have been used instead. In order to preserve the tailpiece, we loosened the gut strings whenever the instrument was not being played. This is perhaps a defensible practice as the strings and tailgut would also thereby be preserved.

At first the significance was not understood of the vertical lines which sometimes appear near the ends of lyre bridges in the ancient vase paintings. It was soon realized, however, that the Greeks had not yet mastered the technique of drawing in three dimensions, they obviously found difficulty in depicting a raised bridge. The vertical lines should be interpreted as legs raising the bridge above the surface of the skin.

String making has always been a very skilled job and there is evidence that the Greeks appreciated this fact. Ptolemy (Harmonics, 2.12) implies that a string must be uniform throughout. Homer (Odyssey, 21.408) mentions the 'well-twisted sheep gut' Nicomachus (Enchiridion, 6) knew that strings must be made of the same material, formed of an equal number of strands, of equal thickness and equally twisted if they are to produce the same note. Ancient Greek strings were not, however, made exclusively of sheep gut – other material such as sinew, flax, thread and twine were used (Pollux, 4.62). Gut viola da gamba strings were bought for the experiment lyre since violin and viola strings were too short.

The lyre was now complete except for the arm band which secured the instrument to the player's left arm while he was performing (plate 74). After this had been put in position finally a band was tied around a pointed piece of horn which served as a plectrum and attached the other end to the tailgut in accordance with the practice of the ancient Greeks (Roberts 1980) (plates 67–68).

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# **Abstract**

Roberts, Helen

# Reconstructing the Greek tortoise-shell lyre

Until recently, classical scholars had little idea of exactly how an ancient Greek tortoise-shell lyre or *lyra* was constructed. The present reconstruction is based on an objective and thorough analysis of the literary and pictorial evidence, and on an understanding of similar modern and ancient lyre-type instruments. This article chronicles the problems encountered in a quest to reconstruct an authentic replica of the ancient Greek *lyra*.

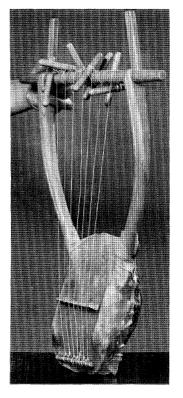


Plate 67 Front view of reconstructed lyra. (Photo: Fisher and Potter, Leicester)

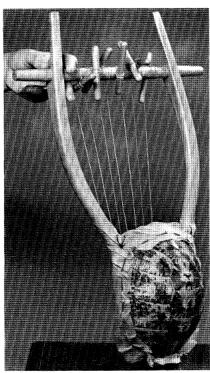


Plate 68 Rear view of reconstructed lyra. (Photo: Fisher and Potter, Leicester)

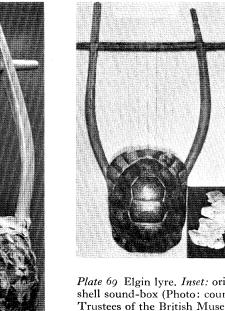


Plate 69 Elgin lyre. Inset: original shell sound-box (Photo: courtesy Trustees of the British Museum)

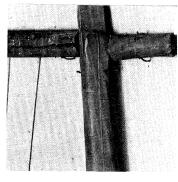


Plate 71 Close-up of Elgin lyre arms. (Photo: courtesy Trustees of the British Museum)

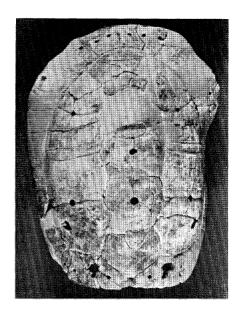


Plate 70 Tortoise-shell lyre soundbox. (Photo: Reggio Museum, Calabria)



Plate 72 Interior of reconstructed tortoise-shell soundbox



Plate 73 Rear view of reconstructed tortoise-shell soundbox



Plate 71 Vase No. G. 142. (Photo: Louvre Museum, Paris)



Polychordia and the Fourth-Century Greek Lyre

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# Polychordia and the Fourth-Century Greek Lyre\*

MARTHA MAAS

few fragments of poetry from the fifth century B.C.; reports from later Greek and Roman writers that mention instruments that are "many-stringed" (polychordai) or have nine, ten, eleven, or "more than seven" strings; and Christian-era lists of "inventors" of new strings: these have led scholars to assume that in the late classical period—during the lifetimes of Euripides and Plato—Greek lyres and kitharas acquired additional strings, the number gradually increasing from the traditional seven to eleven or twelve by the late fifth century. If such a change in the design of these instruments took place during this period, as has been generally believed, it is a sign not only of stylistic changes in Greek music (which we know took place in the late fifth and early fourth centuries), but possibly also of a new stage in the growth of the Greek musical system.

But did such a change take place? Since Plato's diatribes against new trends in music make it clear that the period was one of artistic

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- \* This article, dedicated to Janet Knapp, is part of the *Fest-gabe* of independently published articles offered to her on the occasion of her sixty-fifth birthday.
- ¹ The most extensive discussion of this matter to date is that in Otto Johannes Gombosi, Tonarten und Stimmungen der Antiken Musik (Copenhagen, 1939), pp. 48–77. Others who mention it include Curt Sachs, History of Musical Instruments (New York, 1940), p. 131; R. P. Winnington-Ingram, "The Pentatonic Tuning of the Greek Lyre: A Theory Examined," Classical Quarterly n.s. VI (1956), 169; Max Wegner, Das Musikleben der Griechen (Berlin, 1949), pp. 46–7; Ingemar Düring, "Studies in Musical Terminology in 5th Century Literature," Eranos XLIII (1945), 192; Isobel Henderson, "Ancient Greek Music New Oxford History of Music I, Ancient and OrientalMusic (1957), p. 381; Lukas Richter, "Die neue Musik des griechischen Antike," Archiv für Musikwissenschaft XXV (1968), 12, 14, 16–17; and Solon Michaelides, The Music of Ancient Greece: An Encyclopaedia (London, 1978), pp. 169, 334.

revolution, in which increasingly intricate music was the fashion, it has been easy for scholars to accept the notion that lyremakers and performers responded to these trends by creating and playing lyres with a larger compass. But in Republic 399C-D where Plato seeks to ban "many-stringed" instruments and their makers, he concludes that the only instruments needed in the city are those that do not partake of polychordia—the (chelys) lyra and kithara.<sup>2</sup> This suggests that, despite the texts that appear to say otherwise, the number of strings ordinarily found on such instruments had not grown appreciably by the early fourth century. Information from the visual arts, moreover, does not support the view that extra strings were added during this period.3 Accepting Otto Gombosi's admonition (p. 33) that reports of all sorts, stories about legendary figures included, must be subjected to historical and philological criticism, these conflicting sources are reexamined here with attention to language and context and the historical and technical factors to be considered in presenting evidence from the visual arts.

# The Fifth-Century Evidence

The written evidence for lyres with a specific number of strings (more than seven) comes to us from two widely separated historical periods: from authors of the fifth century B.C. on the one hand, and from authors mainly of the Roman period, particularly those of the second century A.D. or later, on the other. From the early period we have only three items, two of them fragments preserved in the works of authors of the second century A.D.

# Ion of Chios

Cleonides, the second-century A.D. theorist who saved two elegaic couplets by Ion for us (202 Jan), was interested in them because they offered an example of the meaning of the word tonos, which appears here in the word heptatonon, seven toned. Cleonides does not indicate which of the several poets named Ion wrote these lines, but if they are by the fifth-century poet Ion of Chios, as the style seems to indicate, this is the earliest reference to a "lyra" with a specific number of strings more than seven:4

<sup>&</sup>lt;sup>2</sup> John Burnet, *Platonis opera* (Oxford, 1901–02), *Res publica* 399C, lines 7–10, and D, lines 1–8; see also below.

<sup>&</sup>lt;sup>3</sup> Martha Maas and Jane M. Snyder, A History of Stringed Instruments in Ancient Greece (New Haven, 1988), pp. 173, 175, 177, and 179.

<sup>&</sup>lt;sup>4</sup> Translation by Jane M. Snyder, to whom the author is also indebted for assistance in translating passages from Pherecrates, Timotheus and Plato. For a summary of

ένδεκάχοοδε λύοα, δεχαβάμονα τάξιν έχουσα τὰς συμφωνούσας άρμονίας τριόδους.

πρίν μέν σ' έπτάτονον ψάλλον δίς τέσσαρα πάντες Έλληνες σπανίαν μοῦσαν ἀειράμενοι.

Eleven-stringed lyra, having a flight of ten steps to the concordant three-road meeting of harmoniai,

Formerly the Greeks all plucked the seven-toned by fourths, raising a meagre music.

The early date of these couplets (Ion of Chios died before 421) and the fact that other writers of the fifth century such as Euripides (Ion 881) continue to call the family of lyres seven-stringed instruments, while over a thousand vase paintings of the same period also show seven-stringed lyres, make it reasonable to ask whether the term lyra might have another meaning in this context.

We know that *lyra* was commonly used as a generic term. A kithara or a barbitos (the other principal member of the lyre family) might be called a lyra for literary reasons; but the word might even be used in a broader sense to designate any stringed instrument: a *lyropoios*, for example, was in the fourth century a maker of harps as well as lyres.<sup>5</sup> Harps, after many centuries of invisibility in the Greek world (they were known in the Cycladic culture, ca. 2200 B.C.), are seen in quite a number of vase paintings of the late fifth and early fourth centuries, and several well-painted examples have eleven strings (see Harps, below). Names for harps, such as *trigonos*, *pektis*, and *magadis*, were known but little used in fifth-century literature; and Ion may have chosen a word that was at once more poetic and more familiar. If it is the harp that he invokes here, the couplets offer a stronger, more meaningful contrast: the eleven-stringed harp in the first couplet is contrasted with the lyre, "the seven-toned," in the second.<sup>6</sup>

earlier interpretations of the lines, see Flora R. Levin, "The Hendecachord of Ion of Chios," Transactions of the American Philological Association XCII (1961), 296-99.

<sup>&</sup>lt;sup>5</sup> Maas and Snyder, pp. 79–80, 148, 154. Artemon (see below, Later Writers) uses the word in this broader sense, it seems, when he reports that Timotheus justified his use of the magadis (harp) by pointing to a small image of Apollo holding a "lyra" with the same number and arrangement of strings.

The word *triodous* in the first couplet may have a triple purpose: in addition to the literal meaning, it may recall the three-cornered (*trigonous*) frame of the harp as well as suggesting the idea of three tetrachords. An eleven-stringed instrument tuned scalewise would have three tetrachords forming its "three-road meeting of harmoniae," as it might be (in conjunct descending diatonic tetrachords), d' c' b a (a) g f e (e) d c B plus A (proslambanomenos), or a' g' f' e' (e') d' c' b a g f e (a conjunct tetrachord at the top and a disjunct tetrachord at the bottom).

An instrument set up in this way would clearly be capable (with suitable retunings) of playing any melody on its open strings. In the contrasting couplet, however, the words dia tessara suggest that the lyre, on the other hand, was not played, or perhaps

## Pherecrates

In the second fragment, a scene from the *Cheiron* of Pherecrates (a thoroughly obscene piece of Old Comedy) preserved in the pseudo-Plutarch *De musica*, Music personified as a woman complains before Justice that she has been raped by a number of well-known avantgarde poet-musicians of the time; she complains of Cinesias that he has ruined her by changing the *harmonia* within the strophes, and by writing dithyramb rhythms in such a way that if he were dancing the Pyrrhic in armor, his left-foot steps would seem to be his rights! Of Melanippides, Phrynis, and Timotheus she says:<sup>7</sup>

έμοι γὰρ ἦρξε τῶν κακῶν Μελανιππίδης, ἐν τοῖσι πρῶτος δς λαβὼ ἀνῆκέ με χαλαρωτέραν τ' ἐποίησε χορδαῖς δώδεκα.

Φρῦνις δ' ἴδιον στρόβιλον ἐμβαλών τινα κάμπτων με καὶ στρέφων ὅλην διέφθορεν, ἐν πενταχόρδοις δώδεχ' ἁρμονίας ἔχων.

ό δὲ Τιμόθεός μ', ὧ φιλτάτη, κατορώρυχεν καὶ διακέκναικ' αἴσχιστα.

-Ποῖος ούτοσὶὁ Τιμόθεος;

-Μιλήσιός τις πυρρίας. κακά μοι παρέσχεν οίς ἄπαντας ους λέγω παρελήλυθ' 'επάγων 'εκτραπέλους μυρμηκιάς. For Melanippides began the evil; he was the first to seize and debase me and make me looser with twelve [strings or notes].

Next Phrynis, pushing in his [string-]twister, turning and twisting me ruined me utterly by having twelve *harmoniai* on five strings. . . .

But Timotheos, my dearest [Justice], has ruined me and worn me out most shamefully.

[Justice]: Who is this Timotheos?

[Music]: A certain Milesian redhead; this one brought evils to me; all whom I mentioned he's surpassed, bringing strange unmelodious ant-hills, and unholy added notes and whistles; just as though I were cabbages, twisting me, he's riddled me completely with [

even tuned (at least at this time) in this fashion, but in open fourths. Gombosi points out (p. 39) that both the study of instruments and comparative musicology teach us that the tuning of instruments always originates in fifths or fourths, and that "the lyre and kithara (this we can take as an axiom) were also tuned in fifths or fourths"; but he assumes that the lyre was a melody-playing instrument, and that the fourths were only the theoretical framework for pentatonic tunings helped out by stopping the strings. Detailed criticism of his theory is given in Winnington-Ingram, pp. 169–86.

<sup>&</sup>lt;sup>7</sup> Benedict Einarson and Phillip H. De Lacy, eds. [pseudo-Plutarch] *De musica*, 30, in *Plutarch's Moralia* XIV (Cambridge, Mass., 1967), pp. 352–455.

κὰν ἐνύχη πού μοι βαδιζούση Μόνη ἀπέλυσε κἀνέλυσε γορδαῖς δώδεκα. and if he chances upon me somewhere as I'm walking alone, he pulls me down and undoes me with twelve [strings or notes].

The numbers in these excerpts have given considerable trouble to editors and writers of commentaries, who would like them to make musical sense. But as Düring points out (p. 181), the number five, mentioned in connection with Phrynis, can be used in Greek to mean "a few," something that can be counted on the fingers of one hand, while the number twelve can mean "many," "a lot," just as in Shakespeare's *Othello*, when Desdemona asks if there are any women who would cheat on their husbands, Emilia answers, "Yes, a dozen"—that is to say, thousands (IV, iii, 85). Aristophanes, in *Frogs* 1129, makes the actor playing Euripides answer in the same way when asked if Aeschylus has made any mistakes in his poetry. In this passage, then, Phrynis can be said to be accused of producing many tunings on a few strings.

The word twelve, however, meant something more to Pherecrates' audience. It could also have obscene connotations; since according to Borthwick the book that was the *Kama Sutra* of the Greek world was called the *Dodecatechnon*, and twelve is used in this sense by both Aristophanes (*Frogs* 1327) and Plato (frag. 134), the audience was not likely to have missed its double meaning in this scene.<sup>8</sup> In the passages on Melanippides and Timotheos the word *chordais* need not be translated as "strings," especially since no particular instrument is named. *Chorde* also means note, and in both cases *chordais dodeka* may simply be translated as "with many notes."

Timotheos is accused, in words that may also be plays on musical terminology, of having introduced an intricate kind of music that we might suppose required performance with an instrument of many strings. But in the *Laws* 812D, Plato says that schoolboys should not be taught to sing with heterophony or with intricateness of the lyre, implying that such performance would be possible on a schoolboy's (chelys) lyra, the instrument least likely to have acquired extra strings. In this passage Plato speaks specifically of rhythmic intricateness, and the word he uses that means intricate style is *poikilia*, the same word that we find Timotheos himself using in the third of the fifth-century texts that bear on the question of whether the lyre acquired additional strings.

<sup>&</sup>lt;sup>8</sup> E. K. Borthwick, "Notes on the Plutarch *De Musica* and the Cheiron of Pherecrates," *Hermes* XCVI (1968), 69. See the discussion below on the use of *chorde* in Plato, *Philebus* 56A.

# **Timotheus**

This third text, found in one of the oldest known literary papyri (late fourth century B.C.), is a portion of Timotheos' own work, *The Persians*. The existing fragment of this nomos, the longest example of such a work now in existence, consists of over 200 lines of vivid description of the sea battle at Salamis, with a concluding section in which Timotheos identifies himself and replies to criticisms of his music. Here we learn that the nobility of Sparta had accused him of disdaining "the older Muse with [his] new songs." Timotheos defends himself in part by invoking the names of two legendary innovative musicians, Orpheus and Terpander, and then placing himself last in the series:9

νῦν δὲ Τιμόθεος μέτροις ἡυθμοῖς τ' ἑνδεκακρουμάτοις κίθαριν ἐξανατέλλει, θησαυρὸν πολύυμνον οἴ ξας Μουσᾶν θαλαμευτόν Μίλητος δὲ πόλις νιν ἁ θρέψασ' ἁ | δυωδεκατειχέος λαοῦ πρωτέος ἐξ ἀχαιῶν. But now Timotheos has invented kithara-playing with eleven-stroke meters and rhythms, opening up the hidden many-hymned treasure of the Muses. The city that nourished him is Miletus, first among the twelve walled cities of the people from Achaia.

These lines concerning his "invention" are the only indication he gives us as to what the specific objections to his music were.

"Eleven-stroke" (endekakroumatois) comes from the verb kruo, to strike; 10 but scholars ancient and modern have stretched this term to mean eleven-stringed, influenced in part by the other two early fragments discussed above, and in part by the remarks of writers of later times, for this is by no means the last we hear of Timotheos.

# Later Writers

Over 300 years later the Roman author Cicero remarked (*Laws* 2.39) that the old Spartan laws about music were strict, "If indeed it be true," he says, "that the severe Spartans ordered all the strings above seven to be cut from Timotheos' instrument." Artemon (second or first century B.C., quoted in Athenaeus 636e), tells a story about the Spartans' order that Timotheos remove extra strings

<sup>9</sup> Denys Page, ed., *Poetae Melici Graeci* (London, 1962), p. 791, lines 229-33. See also Tjitte H. Janssen, *Timotheus Persae* (Amsterdam, 1984), lines 241-48.

A modern Swedish percussion ensemble has taken the name *Kroumata*. For the *kroumata* of the lyre setting the rhythm for dancers, see Aristophanes *Thesmophoriazusae*, lines 120ff.

from his instrument, which in this text is called a magadis, an instrument that—since a fragment of Anacreon (frag. 374 Page) gives it twenty strings—can be identified as a harp.

At the beginning of the Christian era, when Greek writers enjoyed making lists of the inventors of all sorts of things, another kind of report about specific numbers of strings starts to appear: there are a number of accounts of the "inventors" of various individual strings. While Timotheos is the inventor of the ninth string in the first-century A.D. list of Pliny the Elder (*Natural History* 7.204), he appears for the first time as the inventor of the eleventh in the writings of the late first- or early second-century A.D. Pythagorean theorist Nikomachos (*Excerpta* 4, 274 Jan). It appears that only Latin writers (Pliny and later, Boethius) mention the lyre family in these lists; Nikomachos uses the term *lyra*, but only in the section on the first seven strings (*Excerpta* 1, 266 Jan) and in the one on the eighth string (244 Jan); in the section in which he speaks of strings nine and up, no instrument at all is mentioned, though it ends with a reference to the passage cited above from Pherecrates' *Cheiron*.

In the second century A.D. the story about the musical conservatism of the Spartans begins to be repeated rather often. Plutarch tells it in four different works, in three of them with Phrynis, the poet mentioned in Pherecrates' *Cheiron*, as the protagonist who is said to have lost two of his nine strings to the Spartan official (*Moralia* 84A, 22oC; *Vitae* 9, X.4 also mentions Timotheus). Phrynis appears in a comic vase painting of the fourth century B.C., but the kithara in the painting has only six strings. When Plutarch tells the story of Timotheos (*Moralia* 238C-D), he doesn't mention how many strings in excess of seven Timotheos was said to have. Plutarch names no instrument in any of these accounts except when he speaks of the earlier poet Terpander (*Moralia* 238D), whom he also calls a kitharode (Terpander's kithara was nailed to the wall for having only one string too many). Pausanias (*Description of Greece* 3.12.10), writing later

<sup>11</sup> No two lists agree even reasonably well, except for those of Nikomachos and Boethius (who used Nikomachos' lost *Peri mousike* as a primary source; see Calvin Bower, "Boethius and Nicomachus: An Essay Concerning the Sources of *De institutione musica*," *Vivarium* XVI [1978], 1–45). The inventor of the eighth string, for example, was Simonides according to Pliny the Elder (*Natural History* 7.204), Pythagorus according to Nikomachos, (*Harmonikon Enchiridion* 5, in Karl von Jan, *Musici scriptores graeci* [Leipzig, 1895], p. 244), and Lycaon of Samos according to Boethius (*De institutione musica* 1.20). Nikomachos, *Excerpta ex Nicomacho* 4 (274 Jan) names inventors for the ninth, tenth, and eleventh string and then says "and others added still more till the number reached eighteen."

<sup>&</sup>lt;sup>12</sup> Salerno, Museo Provinciale, Paestan bell krater by Asteas, c. 350 B.C., in A. D. Trendall and T.B.L. Webster, *Illustrations of Greek Drama* (London, 1971), part IV, no. 31.

than Nikomachos, tells the Terpander story of Timotheus, reporting that the Spartans hung Timotheos' kithara in their meeting hall in disapproval of his addition of four "strings" to his kithara-singing (kitharodia).

Modern scholars might have been more skeptical of this persistent story had it not been told yet again over 900 years after the fact by Boethius, who offers a striking new bit of evidence: a Greek text that he presents as a Spartan edict (*De institutione musica* 1.1). This text accuses Timotheos of disdaining the old music, rejecting sevenstringed kithara-playing, using many notes and defiling the hearing of the youth through the *polychordia* and novelty of his melodies, using (rhythmic?) intricateness (*poikilia*) instead of simplicity, changing from the enharmonic to the chromatic genus at the antistrophe, and of an unseemly manner of performance. It states that it was decreed that the rulers and ephors should censure Timotheus, "compelling [him] to cut from the eleven strings the ones beyond seven."

Wilamowitz-Möllendorff, who regarded this text as a fabrication dating from the second century B.C. and a poor imitation of Spartan dialect, points out that it uses much the same words that Timotheos himself used in reporting the Spartan reprimand, suggesting that the source of all these stories may very well ultimately be Timotheos' own enigmatic statement at the end of *The Persians*, however amplified and misunderstood. <sup>13</sup> Even if Boethius' text is in some sense genuine, the tale of cutting strings from Timotheus' instrument may have been added to it at any time during centuries of transmission. Since Timotheos' *Persians* was a popular work that continued to be sung at least 200 years after his lifetime, it may have been the nomos itself, not the existence of an edict, that gave rise to the group of tales about Spartan conservatism.

# Chorde and Polychordia

In the passage from *Republic* 399C-D mentioned at the beginning of this article, Plato names the instruments that are guilty of *polychordia*, "many-stringedness," and *panharmonia* (in the

<sup>13</sup> Ulrich von Wilamovitz-Möllendorff, Timotheos: Die Perser (Leipzig, 1903), p. 70. Calvin M. Bower, translator of Boethius, Fundamentals of Music (New Haven, 1989), pp. xxvi-xxvii and 185, Pierre Courcelle, Les Lettres grecques en occident (Paris, 1943), p. 262, and Ubaldo Pizzani, "Studi sulle fonti del 'De Institutione Musica' di Boezio," Sacris erudiri XVI (1965), 162, are in agreement that Boethius' immediate source for this text was probably Nikomachos, Courcelle because both this text and Nikomachos attribute eleven strings to Timotheos, Pizzani because Nikomachos included another quotation that uses Doric forms, an excerpt from Philolaus, in his Harmonike enchiridion 9 (252 Jan).

lines just preceding, he has determined that only two harmoniai, the Dorian and Phrygian, will be allowed in the city):

Οὐκ ἄρα, ἦνδ' ἐγω, πολυχορδίας γε οὐδὲ παναρμονίου ἡμῖν δεήσει ἐν ταῖς ἀδαῖς τε καὶ μέλεσιν. in our songs and melodies.

Well then, said I, we shall not want polychordia or panharmonia

Οὔ μοι, ἔφη, φαίνεται.

So it seems to me, he said.

Τριγώνων ἄρα καὶ πηκτίδων καὶ πάντων ὀργάνων ὅσα πολύχοςδα καὶ πολυαρμόνια, δημιουργούς οὐ θρέψομεν.

Then we shall not maintain makers of trigonoi and pektides and all instruments of many strings and many harmoniai.

Οὐ φαινόμεθα.

So it appears.

Τί δέ; αὐλοποιοὺς ἢ αὐλητὰς παραδέξη είς τὴν πόλιν; ἢ ού τοῦτο πολυχορδότατον, καὶ αὐτὰ τὰ παναρμόνια αὐλοῦ τυγχάνει ὄντα μίμημα;

Very well, will you receive makers or players of auloi into the city? Or are [the auloi] not the most many-stringed of all, and do not these panharmoniai of the aulos happen to be an imitation [of the panharmonia of the trigonoi]?

Δῆλα δή, ἦ δ' ὅς.

Yes, clearly, said he.

Λύρα δή σοι, ἦν δ' ἐγώ, καὶ κιθάρα λείπεται [καὶ] κατὰ πόλιν χρήσιμα.

You have left, then, said I, the [chelys] lyra and the kithara, and they are useful in the city.

In his wholesale sweeping out of harps (the trigonos and pektis) and auloi, common instruments of the Greek musical culture of his time, it is obvious that Plato retains the chelys and kithara because they are the traditional instruments of education and religion; but also, by his reckoning, these are the only instruments that are not afflicted with the malady of polychordia (or panharmonia, which is his real point in this passage).

The third-century B.C. bucolic poet Theocritus, however, in his sixteenth Idyll, 42-6, places a polychordon barbiton in the hands of a poet of the sixth and early fifth century, Simonides of Ceos:14

<sup>&</sup>lt;sup>14</sup> A. S. F. Gow, ed. Theocritus (Cambridge, 1950), p. 124.

ἄμναστοι δὲ τὰ πολλὰ καὶ **ὄλβια τῆνα λιπόντες δειλοῖς** έν νεκύεσσι μακρούς αίωνας ἔχειντο.

εί μὴ θεῖος ἀοιδὸς ὁ Κήιος αἰόλα φωνέων βάρβιτον ές πολύχορδον έν ανδράσι θηκ' ονομαστούς δπλοτέφοις.

They might have lain unremembered throughout the long ages among the unfortunate dead

Had not the god-gifted singer, the Cean, Singing his Aeolian songs to the many-stringed barbitos Given them fame among those who came after

The barbitos, the third of the chief instruments of the lyre family, is commonly portrayed in the art of the sixth and fifth centuries B.C. as a long-armed instrument of five or seven strings. It is appropriate in this context, for it was an instrument long associated with lyric poets (Alcaeus, Sappho, and Anakreon); but it is very seldom seen in fourth-century sources (except Etruscan ones), and virtually disappears thereafter. The lyre most associated with drinking songs and lyric poetry, the barbitos was perhaps the least likely of the lyres to have become more complicated in its construction. And a number of sources suggest that it did not—that polychordia may be understood in another sense.

The interesting thing about Plato's discussion of polychordia in Republic 399C-D is that, in addition to pointing a finger at the harps (trigonoi and pektides) while endorsing the chelys and kithara, it even contemplates a ban on the ubiquitous reed-pipes, the auloi, calling them the most polychordotaton of all. This is not a unique play on words; there are a number of other examples of it. In a fragment of lyric poetry possibly by the same Simonides mentioned above (frag. 947 Page), the aulos is once again called "many-stringed":

μή μοι καταπαύετ' ἐπεί περ ἤρξατο Ι pray you restrain not [the τερπνοτάτων μελέων ὁ καλλιβόας πολύχορδος αὐλός;

Musel For the pleasing cry of the many-stringed aulos Has begun its joyous melody.

A more graceful translation might substitute "many-voiced" or "many-toned." In these lines from Plato's Philebus 56A (Burnet) the word *chorde* alone is used in connection with the aulos:

Οὐκοῦν μεστή μέν που μουσική πρῶτον, τὸ σύμφωνον ἁρμόττουσα οὐ μέτοω ἀλλὰ μελέτης στοχασμῷ, καὶ σύμπασα αὐτῆς αὐλητική, τὸ μέτρον ἑκάστης χορδῆς τῷ στοχάζεσθαι φερομένης θηρεύουσα, [the piece] one gages each ώστε πολύ μεμειγμένον ἔχειν τὸ μὴ σαφές, σμιχρόν δὲ τὸ βέβαιον.

Music, first of all, is full of [conjecture]; it achieves concordant sounds by guesswork based on practice, not by measurement; in aulos-playing throughout pitch (chorde) as it is sounded by guess, so that the degree of uncertainty involved in it is great, and the degree of certainty small.

Here, of course, one cannot translate *chorde* as "string."

The term polychordia is used in an even more metaphorical sense in two of the plays of Euripides. In the Medea 196-98, Euripides gives to the Nurse lines lamenting that one cannot put an end to great grief with "many-stringed songs" (polychordois odais), while in his Rhesus 546-50 the chorus speaks of how the nightingale sings with a "manystringed voice" (polychordotata gerus).

Since the concept of polychordia was evidently not limited to the literal idea of many strings, but was also fairly commonly used to mean "many notes," possibly in the sense of elaborate style or rapid notes rather than many different pitches, Theocritus' reference to a polychordos barbitos may be understood in these terms, without assuming either that the instrument in question had more than seven strings, or even that it used more than seven pitches. And if the barbitos became a "many-noted" instrument—a matter of playing technique rather than construction—it was not the only member of the lyre family to do so; polychordia is said to have been introduced into "bare" kithara-playing by the fourth-century poet Stratonicus of Athens: so says the fourth- or third-century B.C. historian Phanias (Athenaeus 352C).15 Here the term clearly attaches to the technique rather than to the instrument.

Plato, though he used the term in a more literal way in comparing trigonoi with lyres, condemned the former not simply because they had a few more strings than the lyres, but because they were capable of producing a large number of harmoniai. The comparison of the two types of instruments recalls the interpretation of the couplets of Ion of Chios above (note 6), which suggests that the contrast implied may have been a matter of the difference between melody-doubling harps and rhythm-elaborating and reinforcing lyres.

<sup>15 &</sup>quot;Bare" kithara-playing (psile kitharisis) is understood to mean kithara playing alone, i.e., without singing; but the term may have additional meanings. See Andrew Barker, "Innovations of Lysander the Kitharist," Classical Quarterly n.s. XXXII (1982), 266-69.

# Evidence from the Visual Arts

In the artistic styles of the late sixth and most of the fifth century B.C., particularly in vase painting (which accounts for more than ninety percent of the visual evidence), careful painting of details and a relatively realistic portrayal of people, animals, and objects were highly valued. The result is a remarkable number of paintings of musical instruments that provide excellent two-dimensional detail, as well as the occasional rare attempt at three-dimensional representation.<sup>16</sup>

As the fifth century came to an end, styles began to change rapidly, and the clear, formal style of earlier years (which had gradually become less stiff in the course of the century) gave way to a freer, more expressive style in which details, though still included, are less carefully and realistically portrayed. It becomes difficult to determine how many strings are actually shown in an example at hand, for artists were less interested in executing such details with care. During the fourth century, they became still less concerned with fine detail, and economic conditions depressed the market for fine pots to such an extent that far fewer examples of high quality are found that originated on the Greek mainland. A large percentage of fourth-century vases come from the flourishing workshops in the colonies in Italy; and while many of these are of good quality, the instruments they show are often rather different from those of Greece itself, and the strings are not often individually painted in a way that allows their number to be reliably determined.17

# Harps

There was no need to add strings to the lyre in order to have an instrument with more open-string pitches: such instruments were already at hand.

Harps of three sorts are to be seen in vase paintings after the middle of the fifth century: two types of frame harps and an angle harp (without a post connecting the soundbox to the far end of the neck). All three types sit on or next to the seated player's thigh, with the neck to which the strings are attached serving as a base (sometimes with a protecting bar underneath), and the soundbox usually taking

<sup>&</sup>lt;sup>16</sup> Martha Maas, "On the Shape of the Ancient Greek Lyre," *Galpin Society Journal* XXVII (1974), 113–17; ibid., "Back Views of the Ancient Greek Kithara," *Journal of Hellenic Studies* XCV (1975), 175.

<sup>&</sup>lt;sup>17</sup> A number of examples of late sixth- and early fifth-century Athenian instruments may be seen in John Boardman, *Athenian Red Figure Vases: The Archaic Period* (London, 1975); many instruments on Italiote vases are available in A. D. Trendall and Alexander Cambitoglu, *The Red-Figured Vases of Apulia* (Oxford, 1978).

the side of the triangle nearest the player (some frame harps are shown with the post, rather than the soundbox, nearest the player's chest).

One variety of frame harp, found only in the late fifth century, has a "spindle-shaped" soundbox; of eight available examples, four are by a single painter (The Washing Painter), whose harps have about twenty strings, except for one with fourteen; in the other examples the number of strings is not clear.

The second variety of frame harp, with an arched soundbox like that of the angle harp but provided with a post, is rarely seen in the fifth century, and of three examples located, two are Italiote. The Attic example appears to have at least fourteen strings, and one of the Italiote harps has at least thirteen. Arched frame harps are fairly numerous in the fourth century, and though many do not have clearly indicated strings, those that do have nine, ten, or eleven strings.

Angle harps are seldom seen before the fourth century; and the fourth-century examples (all from southern Italy), still few in number, almost without exception have from nine to thirteen strings (not all are clear enough to count).<sup>18</sup>

# Lyres

Since representations of lyre-family instruments were part of the usual stock in trade of artists in sixth- and fifth-century Greece, thousands of examples of the lyra, kithara, barbitos, and the less common varieties of lyres are to be found painted on vases in museums around the world.

The large number of these vases allows us some valuable insights: we learn, for example, that the larger and more expensive pots, with their more elegant art work, are much more likely to show lyres with seven strings than are the small, cheap, poorly decorated vases, even though both may be made by the same workshop. <sup>19</sup> While it is possible that some artists, influenced by religion and cultural tradition, might have represented instruments of the lyre family as seven-stringed even when they no longer were, we can probably trust the realism of fifth-century portrayals of schoolboys and party-goers, if not the paintings of gods. In any case, artists miss the canonic number seven

<sup>&</sup>lt;sup>18</sup> Maas and Snyder, pp. 151–52, 182–83.

<sup>&</sup>lt;sup>19</sup> Ibid., pp. 65, 95 (and note 102), 142. The barbitos is an exception: ibid., p. 124.

by one, showing six- or eight-stringed lyres, often enough to assure us that the indication of seven strings was not a matter of great religious concern.

Extensive investigations of pottery and other art objects of the fifth and fourth centuries have shown that while in the vast majority of cases lyre-family instruments are shown with seven strings, it is not unusual to find well-executed examples with five, six, or eight strings; but fewer than five strings usually means a poorly-made painting. Instruments with nine strings are very rare: only about eight of them have come to light, and they appear in paintings in which the strings are not carefully or neatly indicated. Ten-stringed lyres remain almost unknown, and eleven- or twelve-stringed instruments continue to be completely absent, unless we are to accept items such as a very carelessly painted late fifth-century vase from Spina, in which perhaps twelve strings are indicated above the player's arm, and only nine below.<sup>20</sup>

Gombosi's theory (p. 77) that the lyre typically had three to five strings before the seventh century, and nine to twelve strings after about 400 B.C., in so far as it relies for support on evidence from works of art, is therefore on shaky ground. His own list consists of some 300 examples: among the 101 objects showing lyres with three, four, or five strings, there are eight vases from Etruscan or South Italian workshops as well as sixteen Roman wall paintings. Of the remaining items with few strings (all from Attic workshops of the sixth, fifth, or fourth century), a large part consists of lyres painted on vases of the smaller varieties, particularly those commonly given careless decoration (small funeral *lekythoi*, for example).

Since Gombosi does not include lyres of seven strings (which would have increased the size of his list sevenfold), the largest part of the evidence (some 174 items) consists of lyres with six or eight strings, which are within the usual limits for classical vase painters. All but four of the fifteen lyres with nine strings are from the Roman period or (four examples) from South Italian sources of the fourth or third century B.C. Two of the three with ten strings—and all of the eleven and twelve-stringed lyres (together only seven examples)—are also from Roman or South Italian sources.

If we take the visual evidence seriously, allowing for factors of quality and style, we find that the information it affords us strongly suggests that the seven-stringed lyre was the norm

<sup>&</sup>lt;sup>20</sup> Ferrara, Museo Archeologico Nazionale 2893, in Nereo Alfieri and Paolo Enrico Arias, *Spina* (Munich, 1958), pl. 92.

throughout the fifth and fourth centuries B.C., and that though instruments with six or eight strings may not have been unknown, a lyre with more than eight strings was very rare if not nonexistent.

Two of the three fifth-century texts (Pherecrates' and Timotheus') seem to require readings that do not involve added strings for the kithara; and Ion's "endekachorde lyra" may well be an elevenstringed "instrument," i.e., harp. The lyre family is excluded from the "many-stringed" category by Plato, and the term polychordia was often used in a metaphorical sense, as we have seen, meaning not "many strings" but "many notes" in passages such as those by Theocritus and Phanias. Polychordia and poikilia appear to be similar terms, both indicating elaborateness and intricateness, though the poikilia spoken of by Plato in Laws 812D is clearly a complication of rhythms rather than a profusion of notes.

The reports of Roman-period writers (farther removed from the culture of classical Greece than we like to think, and inevitably influenced to some extent by the traditions and conventions of their own time) have obscured our understanding of the musical changes that took place in the fifth and fourth centuries B.C., and have reinforced the belief that extra strings were added to lyre-family instruments.<sup>21</sup> If we are to come closer at all to a coherent picture of the evolution of Greek musical customs and systems during the late classical period, we will have to take great care in adding to the contemporary evidence information from accounts written four or five hundred years later. We will need to discriminate insofar as we can between literal and metaphorical meanings and between well-informed and less reliable sources, and in using the visual arts, between hasty work and careful execution, judging each representation with an eye to the style and intentions of the painter.

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<sup>21</sup> Gombosi, p. 33, remarks of the authors of the Christian era that, no longer completely aware of the strong relationship between tonal material and chief instrument, they treat the tone system as something abstract. "In this way the ambiguous reports about the stringing of the lyre . . . arise." But the fourth-century B.C. theorist Aristoxenus himself manages to describe the musical systems underlying melody without a single reference to lyra or kithara, though he speaks often of the aulos and voice. Aristoxenus remarks (41.26–31) that "there is no error so fatal . . . as to base the natural laws of harmonia on any instrument. The essence and order of harmonia do not depend upon any of the properties of instruments" (Henry S. Macran, The Harmonics of Aristoxenus [Oxford, 1902], translation emended restoring harmonia in place of "harmony").



The Pentatonic Tuning of the Greek Lyre: A Theory Examined Author(s): R. P. Winnington-Ingram

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# THE PENTATONIC TUNING OF THE GREEK LYRE: A THEORY EXAMINED<sup>1</sup>

I. It has commonly been assumed that, on ancient Greek instruments of the lyre-type (lyre, barbitos, cithara), when a string had been tuned to a certain note, that note and that note only could be played, until the string was retuned; thus, that a separate string was required for each note of a given scale. This (which may be called the orthodox) view involves certain difficulties. The canonical number of strings was seven, and seven-stringed lyres and citharas continue to be represented in art throughout the classical period. But, with one note to each string, a seven-stringed lyre could not even play a complete diatonic octave. Towards the end of the fifth century the number of strings on the cithara (or on some citharas) was raised to eleven and then to twelve. With one note to each string, it may be doubted whether, even so, citharodes could play either a note-for-note accompaniment to each and every melody then in use or the free and florid accompaniments implied by Plato (Laws 812 d). To meet such difficulties, it has been suggested that a technique of 'stopping' was employed, i.e. that the string-length was shortened transitorily by means of finger-pressure so as to produce a note of higher pitch without the slow process of retuning.<sup>2</sup> If this could be done, a seven-stringed lyre could play more than seven, a twelve-stringed cithara more than twelve, notes. The accordatura of the instrument might well, in that case, present gaps in the basic scale—gaps which were filled in performance by stopping.

Later in this article (Section VII) I shall suggest that what we know of the construction of these instruments and the mode of playing upon them makes it doubtful that such a technique could have been employed to any considerable extent. It is not, however, my purpose to go into this highly complicated question as a whole, still less to disprove the employment, to any degree or in any circumstances, of stopping or of 'gapped' accordature. I have a more limited object, which is to examine a particular theory of the tuning of the Greek lyre that has gained some currency, namely that the lyre (barbitos, cithara) had a standard pentatonic accordatura—or rather two alternative and closely related pentatonic accordature. The theory was first advanced by C. Sachs in 1924 in an article on the instrumental notation; and he has since upheld it in a number of publications. Its main features can be summarized as follows.

The diatonic octave was obtained on six strings, not eight. These six strings were tuned to a pentatonic scale without semitones: either EGABDE or

- <sup>I</sup> This article was read in draft by Mrs. M. I. Henderson, to whom I owe a number of valuable suggestions.
- <sup>2</sup> Arist. Probl. 19. 12 refers to  $\delta\iota\dot{a}\lambda\eta\psi\iota s$ , by which is clearly meant the application of pressure to the central point of a string: the note sounded on either side of this point will be an octave higher than the note of the undivided string. It is not, however, clear whether the writer envisages a practical technique or an experiment upon the monochord. Athenaeus, 14. 638 a (on Lysander of
- Sikyon) may possibly be referring to such a technique, but the interpretation is doubtful. For a method other than stopping of raising the pitch of a string without retuning see p. 184.
- <sup>3</sup> 'Die griechische Instrumentalnotenschrift' (Zeitschrift f. Musikwissenschaft, vi [1924], 289–301). Cf. 'Die griechische Gesangsnotenschrift' (ibid. vii [1925], 1-5); History of Musical Instruments, pp. 131-5; Rise of Music in the Ancient World, pp. 203-5.

F G A C D F. In the E octave the notes F and C had no string of their own, but were obtained, respectively, from the E and B strings by stopping. The Fs in the F octave were obtained by retuning the E strings, the C by retuning the B string, and, when this had been done, the Es and the B could no longer be obtained on open strings. Stopping was also employed to provide whatever 'accidentals' were required in rendering the various harmoniai or tonoi2 in all three genera (enharmonic, chromatic, and diatonic). Given the basic E or F accordatura, no retuning of strings was necessary in order to pass from one scale to another. Detailed illustration will be forthcoming when we examine Sachs's interpretation of the instrumental notation. For it is an essential support of his view that this notation, with its triads of symbols, was a 'tablature': of the three forms in each triad, the basic form indicated the open string, the first modification (Liegezeichen) stopping with the index finger, the second modification (Wendezeichen) stopping with the middle finger. The symbols signified not pitches, but strings and fingering.

Sachs's theory is mentioned with favour by Abert,<sup>3</sup> Vetter,<sup>4</sup> and Düring.<sup>5</sup> It forms the basis of O. Gombosi's interesting speculations in his *Tonarten und Stimmungen der antiken Musik*; and Gombosi's views have doubtless reached a large audience of musicologists through the chapter on ancient Greek music in G. Reese's *Music in the Middle Ages*. So far as I am aware, the pentatonic hypothesis has not been subjected to a critical examination. There is a case against it; and this case should not be allowed to go by default, with the result that a dubious theory becomes an accepted doctrine. I am accordingly setting out in this paper a number of arguments which seem to tell, in varying degrees, against the hypothesis. If its claims can stand up to examination, it certainly represents an important forward step in our knowledge of Greek music. But it is surely better to confess ignorance than to build an elaborate structure upon a foundation which is (as I fear) unsound.

The principal evidence adduced in favour of the hypothesis—by which I mean the ground common to Sachs and Gombosi—comes from the instrumental notation, which must, therefore, be the principal object of examination. It is examined in Section IV below. But I will first discuss briefly some other evidence, archaeological and literary, with which the hypothesis has been supported and will then refer to a number of passages in ancient authors which seem to tell strongly against it.

# II. Lyre-type instruments with four strings only (in a few cases, three or five)

- r For the sake of simplicity, I employ only capital letters for the notes of the scale. As we shall be dealing with the central octave only, no confusion, I trust, arises. I read the scales upwards, since I think most people find this easier to follow. In doing so I imply nothing about the theoretical structure of the scales or the tendencies of Greek melody.
- <sup>2</sup> For the purposes of this article it is perhaps unnecessary to draw the distinction between  $\dot{a}\rho\mu\nu\nu\dot{a}$  and  $\tau\dot{o}\nu\sigma$ s which some contexts demand. Only that portion of each  $\tau\dot{o}\nu\sigma$ s will come under consideration which lies in the central range of the voice.
- <sup>3</sup> Pauly-Wissowa, XIII. ii, col. 2485 (s.v. Lyra). The paragraph in question has all the appearance of a hasty afterthought: Quintilian 12. 10. 68 (II. 273 Teubner) is quoted as Aristid. Quintil. II. 273; by Plutarch de mens. 16 a reference to the de musica (on Phrynis) is intended. The wrong chapter reference and 'Aristides' both derive from Sachs's article.
  - <sup>4</sup> P.-W. xvi. i, col. 851 (s.v. Musik).
- <sup>5</sup> Ptolemaios und Porphyrios über die Musik, p. 219 n. 5; 'Studies in Musical Terminology in Fifth Century Literature' (Eranos xliii [1945], 176-97, esp. 192 ff.).

are represented on vases and other monuments of the geometric period. It is argued that these instruments must have provided, and by means of stopping (or a similar device) could have provided, an octave scale. Two assumptions lie behind this argument: (i) that the accompanying instrument necessarily played every note of the vocal melody, and (ii) that the melodies of this period had the range of an octave. Neither assumption can be regarded as certain. It cannot be too strongly emphasized that, while we know little enough about the fifth century, we know virtually nothing about the scales employed in archaic Greece. It may, however, be significant that some of our scanty evidence concerns scales of limited range.<sup>2</sup> If the technique of stopping was in fact practicable on these early four-stringed instruments, it may of course have been employed so as to give them a greater capacity than four notes. But their existence does not go very far to prove that the technique was employed—much less that their successors with more strings were confined to standard pentatonic accordature.

Literary evidence which bears directly upon the tuning of the lyre is almost wholly lacking.<sup>3</sup> A couple of passages in ancient authors have been held to imply a pentatonic accordatura.

- (i) In a fragment of the late-fifth-century comic poet Pherecrates quoted in Plutarch de musica, ch. 30 (§§ 302 ff. W.-R.), Phrynis is said to have corrupted music 'with twelve harmoniai on five strings' (ἐν πέντε χορδαῖς δώδεχ' ἀρμονίας ἔχων). This is taken to mean that, as on the hypothesis, he was able to play twelve (or a large number of?) harmoniai on a cithara pentatonically tuned. The text has generally been regarded as unsound and has been much emended. There are difficulties in taking it as it stands. The school of citharodes to which Phrynis belonged is associated particularly with the addition of strings to the instrument, which is referred to above and below in connexion with Melanippides and Timotheus. The number of strings required, on the hypothesis, to play a multiplicity of harmoniai is six and not five (the term pentatonic being misleading in this connexion). The interpretation, with or without emendation, of this difficult passage must, therefore, be the conclusion and not the starting-point of an argument.<sup>4</sup>
- <sup>1</sup> L. Deubner, 'Die viersaitige Leier' (Athen. Mitteilungen, liv [1929], 194-200).
- <sup>2</sup> Notably the evidence of Plutarch, mus. ch. 11 (§§ 104 ff. W.-R.) and ch. 19 (§§ 172 ff.), on the spondeion. Cf. Class. Quart. xxii. 2 (1928), 83 ff. The 'defective' spondeion with its compass of a minor sixth argues for the genuineness of the 'defective' scales in Aristides Quintilianus, 1, ch. 9 (13. 12 ff. Jahn): the Ionian with its compass of a seventh, the syntonon Lydian with its compass of a minor sixth. Other grounds for believing the scales of Aristides to be genuinely ancient are given by J. F. Mountford in Class. Quart. xvii (1923), 126 ff.
- <sup>3</sup> Book 19 of the Aristotelian Problems gives a disappointing yield. There is the difficulty whether, in any particular case,  $\chi o \rho \delta \dot{\eta}$  means 'string' or (as it admittedly came to mean) 'note'. In 18, which refers to singing, it must mean 'note'. Only 20 and 36 refer directly to tuning. In 20  $\chi o \rho \delta \dot{\alpha}_S$  (89.
- 5 Jan) must mean 'strings', but only mese and lichanos are specified. In 12 Monro restored  $\sigma\nu\mu\psi\hat{\eta}\lambda\alpha\iota$  and  $\psi\hat{\eta}\lambda\alpha\iota$  with great plausibility, in which case the reference is to the playing of strings, but the only strings mentioned are mese, paramese (or paranete), nete and hypate. All these strings existed on the pentatonic hypothesis. The other relevant Problems can all be interpreted in terms of notes of the scale rather than strings of the lyre.
- <sup>4</sup> One might suppose that Phrynis, to demonstrate his virtuosity, took a five-stringed lyre and played on it in a multiplicity of harmoniai. But this would be a special and unsupported hypothesis designed solely to explain this one debatable text. Sachs and Düring (article in Eranos—see p. 170, n. 5) suggest that he used a mechanical device of his own invention  $(\sigma\tau\rho\delta\beta\iota\lambdaos)$  for this purpose. But this interpretation of the text is highly speculative.

- (ii) In Quintilian, instit. orat. 12. 10. 68, the words cum in cithara quinque constituerunt sonos might refer to the initial tuning of five (again, not six) strings, but the language which follows suggests that the quinque soni are the 'standing-notes' of tetrachords, the intervals between which are filled with a variety of notes. It must be confessed that Quintilian (a late writer for our purposes) has not made his meaning very clear.
- III. Upon these passages the hypothesis, if proved on other grounds, might conceivably throw light, but they are in themselves negligible support for it.<sup>2</sup> To set against them there is a number of passages in ancient authors which seem to imply that the lyre and cithara needed to be tuned specifically for the various harmoniai. They do not prove that stopping and 'gapped' accordature were never used in any circumstances. But the hypothesis supposes, not only that certain notes in the series were obtained by stopping, but that a common tuning—or either of two common tunings—enabled the player to play in all the required harmoniai or tonoi. For instance, in the E-tuning, there is no essential technical difference between Dorian, Hypodorian, and Phrygian: all the open strings are used and two notes are obtained by stopping.<sup>3</sup> The passages are as follows:
- (i) Aristophanes, *Knights* 987 ff.<sup>4</sup> Cleon, said his schoolfellows, would only tune his lyre to the Dorian *harmonia* and would learn no other.
- (ii) Plato, Laches 188 d. Here again the writer speaks of tuning the lyre—or rather the whole life—to a particular harmonia. On any normal interpretation, of ἀρμόττεσθαι λύραν, it is implied that the different harmoniai (Dorian, Ionian, Phrygian, Lydian) required different tunings. To accommodate these passages to the hypothesis we should have to suppose that the expression referred not to tuning, but to playing (with different 'Griffe') in these harmoniai. But there are other passages in Plato where ἀρμόττεσθαι λύραν (or ἀρμονίαν) is used of tuning; and, while none of them implies a diversity of tunings, they make it very hard to take the expressions in the Knights and in the Laches in any other sense than that of tuning the lyre to a specific harmonia.
- (iii) Plato, Republic 399 c-e, contrasts with the lyre and cithara other instruments which are described as πολύχορδα καὶ πολυαρμόνια (including the aulos, described as πολυχορδότατον). The point must surely be that the aulos, as by
- <sup>1</sup> Cf. R. G. Austin's note (following Mountford) in his edition of Quintilian 12. The principle seems right, though the details are obscure.
- <sup>2</sup> Gombosi (*Tonarten*, pp. 20 f.) also invokes Plutarch, mus. ch. 39 (§ 406 W.-R.). It by no means follows, however, that, because tritai and parhypatai were flattened 'in addition to' or 'in the direction of' (the two possible senses of  $\pi\rho\sigma\sigma$  in  $\pi\rho\sigma\sigma\alpha\nu\iota\acute{e}\nu\tau\epsilon$ s) the standing-notes, they were produced from the same strings as the latter. Indeed, on the hypothesis, they were 'pien-tones' (v. infra) and their intonation was thus completely under the control of the player.
- <sup>3</sup> Dorian: EfGABcDE. Hypodorian: Ef#GABcDE. Phrygian: Ef#GABc#DE. (Lower-case letters are used for notes obtained by stopping.)

- 4 φασὶ γὰρ αὐτὸν οἱ | παίδες οἱ ξυνεφοίτων | τὴν δωριστὶ μόνην ἂν ἀρ|μόττεσθαι θαμὰ τὴν λύραν, | ἄλλην δ' οὐκ ἐθέλειν μαθεῖν.
- <sup>5</sup> άρμονίαν καλλίστην ἡρμοσμένος οὐ λύραν ... ἀλλὰ ... τὸν βίον ... ἀτεχνῶς δωριστὶ ἀλλ' οὐκ ἰαστί, οἴομαι δὲ οὐδὲ Φρυγιστὶ οὐδὲ λυδιστί, ἀλλ' ἤπερ μόνη 'Ελληνική ἐστιν άρμονία.
- 6 Rep. 349 e (μουσικὸς ἀνὴρ ἀρμοττόμενος λύραν . . . ἐν τῆ ἐπιτάσει καὶ ἀνέσει τῶν χορδῶν); Rep. 591 d; Phaed. 85 e ff.; Theaet.
   144 e.
   7 In Stesichorus (25 b Diehl = Simonides
- <sup>7</sup> In Stesichorus (25 b Diehl = Simonides 46 Bergck) πολύχορδος of the aulos is more probably a conscious metaphor than a 'faded' use. So too in this Platonic context, though in this case it might be a refurbishing of a use already faded.

then developed, and stringed instruments with many strings could play in a variety of harmoniai without the necessity of retuning and that, to the disgust of Plato, modulation was facilitated thereby; the lyre and the cithara, on the other hand, had sufficient strings only for a single harmonia and needed to be retuned before playing in another. But, according to the hypothesis, all that was needed to change from one harmonia to another was a different stopping of strings which had been tuned once and for all. Thus the lyre and cithara were in effect πολυαρμόνια, like the rest.

(iv) Athenaeus (*Deipnosophists* 14. 637 b-f) quotes from a certain Artemon an account of a musical instrument of short-lived popularity invented by a certain Pythagoras of Zacynthus. It was called τρίπους or 'tripod'; and the essential feature of its construction was that each of the three spaces between the legs accommodated a set of strings. The spaces were assigned to the three harmoniai: Dorian, Phrygian, and Lydian. When the player wished to change from one to another, he revolved the contraption, which rested on a pivot, with his foot. The process, remarks the writer, was so rapid that anyone who did not see what was happening, but judged by ear alone, thought he was listening to three citharas differently tuned.2 There is no good reason to doubt the story, which implies—certainly for the date of Pythagoras and possibly for the date of Artemon<sup>3</sup>—that, normally, citharas were specifically tuned to the Dorian, Phrygian, and Lydian harmoniai and delay was involved in changing from one to another on the same instrument. But, on the hypothesis, no such delay would be involved: the citharode could pass rapidly from harmonia to harmonia by changing his fingering.

The evidence of these passages<sup>4</sup> relates, as so little of our evidence does, to the classical period and makes it difficult, if not impossible, to believe that the standardized pentatonic accordature prevailed during that period. It could hardly be argued, however, that the inception of the instrumental notation, if not its completion, was later than the fourth century; and the interpretation of this notation which provides the primary evidence for the hypothesis is intimately bound up with the view that stopping was used extensively to produce a multiplicity of harmoniai from a common tuning. If it proves anything, it proves that; in which case it may be thought to prove too much. We must now turn to the notation and consider whether in fact it proves anything at all about the accordatura of the lyre.

- IV. Thanks to Alypius, we can read the notes of the pieces of ancient Greek music which have come down to us. But we are bound to recognize certain anomalies in the notations which he records. The same symbol has different values in different *tonoi*; the same note is represented in different *tonoi* by different symbols. It is not surprising that a number of theories has been
- I Plato here disregards the increase in the number of strings on the cithara, which may have been subsequent to the dramatic date of the Republic, and which in any case fell short of the πολυχορδία of, for example, the magadis. Essentially the same point is made by Aristides Quintilianus, 2. 18 (65. 19 ff. Jahn), where he contrasts stringed and wind instruments: the former are  $\mathring{a}μετ\mathring{a}βολα$ , the latter  $\mathring{e}s$  το  $μεταβ\mathring{a}λλειν$   $\mathring{e}f$  εὐθέος  $\mathring{e}πιτ\mathring{b}εια$ , i.e. 'suited to rapid modulation'.
- 2 τριῶν κιθαρῶν . . . διαφόρως ήρμοσμένων.
- <sup>3</sup> Pythagoras of Zacynthus is mentioned as a theorist by Aristoxenus, 2. 36 (127. 24 Macran). I know of no other evidence by which he can be dated. Artemon, of Cassandreia, is probably of the second or first century B.C.
- <sup>4</sup> Sachs quotes (iii) and (iv) without, apparently, perceiving their bearing upon his own theory.

advanced to account for these phenomena or that the notations have been invoked in support of theories of the Greek scale-system. At one point or another, however, the interpretation tends to break down and special hypotheses have to be introduced to make the notations fit the theories. A theory which really did explain every feature of the notations, without recourse to such special hypotheses, would indeed be welcome.

It is commonly agreed that of the two notations, instrumental and vocal, the instrumental is the older. It is characterized by the use of triads or groups of three related symbols: e.g.  $F \perp A$ ,  $C \circ A$ . The lowest in pitch of the three symbols is the basic letter-form; the second is the same form laid on its back; the third is the same form reversed.2 It will be convenient to refer to them as 'first position (FP)', 'second position (SP)', and 'third position (TP)' symbols, respectively. It has generally been assumed that each triad was intended to represent a pycnon, i.e. a close-set group of notes in the enharmonic or chromatic genus. The essential feature of the Sachs-Gombosi hypothesis is that the symbols relate not to notes but to strings: FP indicates that the open string was to be used; SP that the pitch of the string should be raised by means of pressure with the middle/index finger; TP that its pitch should be raised by means of pressure with the index/middle finger. Sachs and Gombosi differ as to the fingering; in what follows I shall speak in terms of Gombosi's view that SP indicates the middle finger and TP the index finger. It should be observed that while the index-finger was used in some cases, on this hypothesis, to raise the note of the open string by the interval of a tone (Ganztongriff), it was used in other cases to raise it by a semitone only (Halbtongriff): the distinction between the two modified symbols is one of fingering and not of pitch.

The FP symbols provide a continuous diatonic series.<sup>4</sup> This happens to be the series of notes required in the diatonic form of the Hypolydian tonos (which is thus conveniently regarded as the 'natural key'). But, while FP symbols are used, taking the central octave of that tonos, for E G A B D E, the notes F and C are indicated by means of the SP forms of the E and B triads. Why were the FP forms of the F and C triads not used? The question is eminently legitimate. The answer given is that these notes were not produced on F and C strings, which were not in fact available to be played, but by means of middle finger pressure on the E and B strings, respectively, this being indicated by the symbol used. If it is asked why, when there were no strings for F and C, triads of symbols were provided based on F and C, the answer given is that there was an alternative tuning, also pentatonic, in which the E string was tuned to F, the B string to C (in which case they were not of course available for playing E and B). The accordatura was then: FGACDF. The F and C triads were necessary for noting those tonoi which employed this 'high' tuning. According to Gombosi, a C string was actually added as the seventh string; it was not, however, used (or not normally used)<sup>5</sup> as an addition to the B string, but as an alternative to it. Let us see how the system works out.6

- <sup>1</sup> No convincing theory of the origin of these forms has yet been advanced.
- <sup>2</sup> There are some exceptions, which, though they may have a bearing on the history of the notation, need not be discussed here.
  - <sup>3</sup> Cf. Gombosi, *Tonarten*, p. 21, n. 1.
- <sup>4</sup> The notation of this series will be found in Grove's Dictionary of Music and Musicians,

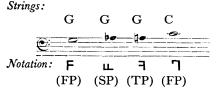
5th edition, iii. 779; of all the triads in Gombosi, Tonarten, p. 20. There are complete tables in Gevaert, Histoire et théorie de la musique de l'antiquité, i. 408-15, and in other comprehensive works.

- <sup>5</sup> See, however, p. 176.
- <sup>6</sup> I have been much helped here by Gombosi's full and lucid exposition.

It is convenient to begin with the set of tonoi in which the central octave stretches from F to F. These are the Hypodorian, Hypophrygian, Hypolydian, Dorian, Phrygian, Lydian, Hyperdorian (formerly Mixolydian); the Hyperphrygian and Hyperlydian duplicate the Hypodorian and Hypophrygian at the octave.<sup>2</sup> In these tonoi the enharmonic and chromatic pycna are (with a few exceptions) noted with a complete triad, i.e. the barypycnon is played on an open string, the mesopycnon and oxypycnon<sup>3</sup> are obtained, respectively, by pressure with the middle and the index fingers, but the notes so obtained vary according to the genus, i.e. in the enharmonic the index finger raises the pitch of the string by a semitone, in the chromatic by a tone. In certain cases, where the barypycnon is not obtainable on an open string (i.e. Hyperdorian meson, Dorian and Hyperdorian synemmenon), we find a scheme of notation which prevails in the second category of tonoi and which will be discussed below. Apart from these anomalous tetrachords, no difficulty arises at first sight, though on reflection one may ask a question. In the chromatic, the note of the oxypycnon is in many cases identical with that of an open string: e.g. in the Phrygian chromatic, lichanos meson is an A, and A is the note of an available open string. Why did the player have to employ this presumably difficult and possibly unsatisfactory technique of obtaining A by pressure on the G string rather than use the A string which was available?<sup>5</sup> It seems perverse and unpractical, but, if we take the notation as a tablature (and as telling the truth), that must be what the player did.

The diatonic parhypatoeide were (with the same exceptions) noted with a SP symbol, indicating middle finger pressure on the open string. The diatonic lichanoeide—and certain of the 'standing-notes'—also involve in many cases the raising of a string by a semitone. In these cases, however, the symbol employed is not SP, but TP. For example, in the Dorian tonos diatonic lichanos meson is Ab, obtained ex hypothesi by pressure on the G string. Why in this case was the TP symbol used, whereas the SP symbol was used for the Ab which is diatonic (or chromatic) parhypate meson in the Phrygian? Why is Dorian mese noted 2 and Lydian parhypate meson  $\odot$ , though both are obtained ex hypothesi by raising

- i.e. the central range of pitch, containing the notes hypate meson to nete diezeugmenon according to the thetic nomenclature.
- <sup>2</sup> In the Hypolydian and Lydian, though the central octave extends from F to F, the F's are, according to the hypothesis, obtained from strings tuned to E. The Hypolydian, which requires a B, is in fact tuned (ex hypothesi): E G A B D E.
- <sup>3</sup> Convenient terms of Greek theory (βαρύπυκνον, μεσόπυκνον, ὀξύπυκνον) for indicating the lowest, the middle, and the highest notes of an enharmonic or chromatic pycnon.
- 4 e.g. the tetrachord meson of the Phrygian tonos in the chromatic genus:



- <sup>5</sup> It is not open to adherents of the hypothesis to argue that the notation was different because the two notes were not in fact identical: for them the notation is concerned with strings and fingering, not with subtleties of intonation.
- <sup>6</sup> The terms parhypatoeidē (παρυπατοειδῆ) and lichanoeidē (λιχανοειδῆ) are convenient for indicating the notes which come, respectively, second and third in the standard tetrachord (reading upward). The former includes both parhypatai and tritai, the latter both lichanoi and paranetai.
- <sup>7</sup> e.g. the tetrachord *meson* of the Dorian *tonos* in the diatonic genus:



the same string by a semitone? The practice is formulated by Gombosi (Tonarten 23): 'wenn unter dem alterierten Ton ein ebenfalls alterierter Ton liegt, wird I [index finger pressure] genommen, wenn aber leere Saite, dann 2 [middle finger pressure]'. This assumption is clearly necessary, if the scheme is to work out and the appearances be preserved: its technical necessity is by no means obvious.<sup>1</sup>

Special difficulties arise (and are discussed by Gombosi) in connexion with the tetrachord *synemmenon* in four of the *tonoi*. (It is assumed, perhaps rightly, that the interplay of the tetrachords *diezeugmenon* and *synemmenon* goes back to an early stage.)

- (a) In the Hypolydian diatonic the note C, and in the Lydian diatonic the note F, are required both as trite diezeugmenon and as paranete synemmenon. They are differently noted in the two tetrachords: trite diezeugmenon with SP symbols of the B and E triads, respectively; paranete synemmenon with the symbols of the open C and F strings, which were, however, ex hypothesi not available. Two explanations are open to adherents of the hypothesis: either paranete synemmenon was really obtained, like trite diezeugmenon, from the B (E) string and the notation was conventional (and misleading); or two strings were actually employed. But the latter explanation is not open except in the case of the Hypolydian and to those who (with Gombosi) admit the C string along with the B string. If the players were prepared to use both of the alternative strings in this case, is it not surprising that they did not make freer use of this convenience? Why not, for instance, play trite diezeugmenon also on the open C string? There are surely limits to the power of tradition and convention when confronted with practical utility. And can we really believe that the same note was played on two different strings for purely theoretical reasons?
- (b) The difficulty in the Dorian and Hyperdorian (Mixolydian) is somewhat similar. Trite synemmenon is noted in the Dorian on the open B string, in the Hyperdorian on the open E string. But these strings were ex hypothesi not available. Here again Gombosi is inclined to believe that in the Dorian the B string was actually employed along with the C string; and again one may express surprise that such a licence, if employed at all, was employed so sparingly. The alternative is to suppose that, although noted with symbols proper to the B and E strings, these notes were actually obtained from the A and D strings by means of a Ganztongriff. A notational convention? But a convention thoroughly destructive of the system. (We shall meet with its like again.)

There are thus certain difficulties in applying the hypothesis to the group of tonoi so far considered (\(\pi\) and \(\ph\) tonoi). We must now turn to the other group (\(\p\) tonoi), in which the central octave stretches from E to E. These are the Hypoionian, Hypoaeolian, Ionian, Aeolian, Hyperionian and Hyperaeolian (which duplicates the Hypoionian at the octave).

It is convenient to begin by considering the chromatic genus. The character-

- <sup>1</sup> It is not adequate to say that the middle finger (Sachs: index finger) was already engaged in stopping the string of lower pitch. This, if true, was only true when the two notes occurred consecutively in the melody.
- <sup>2</sup> The open C string is used in the Dorian, the open F string in the Hyperdorian, for paramese.
- <sup>3</sup> According to Gombosi the Hypolydian and Lydian had a double function: the former served both as a 'high' Hypolydian and as a 'low' Dorian, the latter both as a 'high' Lydian and as a 'low' Mixolydian. There is much to be said for this view, which is perhaps confirmed by the recently published Oslo papyrus (cf. Symb. Osl. xxxi [1955], 54.

istic notation of the pycna can be illustrated from the tetrachord meson of the Aeolian tonos, where the pycnon is noted  $\exists$  C O, i.e. the mesopycnon is given a FP symbol, the barypycnon and oxypycnon TP symbols. In terms of the hypothesis, the mesopycnon is played on an open string, the oxypycnon and barypycnon by means of index finger pressure on that string and on the next lowest string, respectively. Here it may be asked why the oxypycnon is played with pressure by the index finger and not the middle finger. According to the formulation quoted above (p. 176) it is the middle finger which is used to raise the pitch by a semitone, when the next lowest note is played on an open string. Thus the chromatic pycna of this group introduce a new principle of fingering, which ought to be explained. Why should the interval A-A# in the Aeolian be noted C O, the interval A-Bb in the Lydian O O O ?

The enharmonic and chromatic share a common notation, but a special difficulty arises in the case of the enharmonic, whenever (as is most common in this group) the *mesopycnon* falls to be played on an open string. In those *tonoi* (Hypoaeolian, Aeolian, Hypoionian/Hyperaeolian) which employ open strings for the *mesopycna* only, the intonation of all the other strings could be adjusted into correct relationship with the *mesopycna*; and it was thus possible (on the hypothesis), if difficult, to play in the enharmonic genus in these *tonoi*. In the Ionian and Hyperionian, however, the open B string is used, in the Ionian for *mese*, in the Hyperionian for *hypate meson*. These notes could not be adjusted, and it was thus impossible to execute the enharmonic in those *tonoi*. It will readily be agreed that, on the hypothesis, the *tonoi* of this group were not well adapted to the enharmonic. It is indeed hard to credit the practical reality of a scale in which only the enharmonic *mesopycna* were played on open strings. Is it much easier to credit scales in which only the chromatic *mesopycna* were

He also assumes a 'low' Hypodorian, below the fifteen tonoi of Alypius, of which the Hyperionian would be a duplicate at the octave. There are no grounds, however, for supposing that the theoretical system ever embraced such a tonos: the assumption that Ptolemy conceived his tonoi in 'low tuning' is unfounded (see also p. 182, n. 3).

re.g. the tetrachord meson of the Aeolian tonos in the chromatic genus:

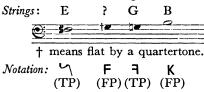


<sup>2</sup> The exceptional tetrachords are: Ionian synemmenon, Hyperionian meson, synemmenon, and hyperbolaion (see p. 180).

<sup>3</sup> Again, it is not open to adherents of the hypothesis to say that the A# and the Bb differed in pitch and were therefore noted differently (see p. 175, n. 5). On the hypothesis, both notes were 'pien-tones' (v. infra) and their intonation under the full control of the player.

4 e.g. the tetrachord meson of the Ionian 4599.2

tonos in the enharmonic genus:



The F# is played (ex hypothesi) on the E string. On the question why a symbol of the F triad is used see p. 178 below).

<sup>5</sup> See, however, pp. 182 f. for adjustments to the basic tuning which in some cases the hypothesis seems to require—though not on so extensive a scale.

<sup>6</sup> Gombosi unwisely seeks to support this conclusion by reference to the tables in Alypius, from which the Ionian and Hyperionian enharmonic are absent. They are absent because they fall in a large lacuna, coming at the end of the treatise, beginning half-way through the Hyperphrygian enharmonic, and involving the entire Ionian and Dorian groups. There is no reason whatever to suppose that the original was incomplete. The missing diagram in Arist. Quint. 1, ch. 11 (16. 30 J.) clearly gave the notation of all fifteen tonoi in all three genera.

played on open strings? (This type of objection, however, must await a later section.)

The most serious difficulty which the hypothesis encounters relates to the diatonic form of several of these tonoi. In a large number of cases it is necessary to note E-F# and B-C#. Ex hypothesi F# and C# were obtained by means of a Ganztongriff on the E and B strings, respectively, but they are noted with symbols belonging to the F and C strings, respectively—strings which were ex hypothesi non-existent (or at least, in the case of the C string, not available). For instance, the interval E-F# in the Hypoionian, Hypoaeolian, Ionian, Aeolian, and Hyperionian<sup>I</sup> is noted  $\Gamma \hookrightarrow \Gamma$  represents the open E string, and \( \should \) should represent index-finger pressure on the F string. Why use the symbol of a non-existent string rather than the TP symbol of the string on which the note has in fact to be played?<sup>2</sup> Gombosi (Tonarten, 26) refers to this phenomenon as 'eine Selbstverständlichkeit die in den obigen Regeln eigentlich inbegriffen ist'. The relevant rule is presumably that which he has formulated on the preceding page: 'die abgeleiteten Zeichen bezeichnen Halbtongriffe (von ihrem eigenen Stammzeichen aus gerechnet)'. The symbol \(\sigma\) must be played as a semitone above F, but, since there is no F string (in these tonoi), it must be played with a Ganztongriff from E. Gombosi seems quite unaware what a serious blow is thus struck at the whole method of interpretation. We are told to regard the notation as a tablature. Surely we are entitled to ask of a tablature that it shall indicate on which string the player is to play and with what fingering. But the notation at this point is governed, not by the string, but by the note: \( \) indicates a relationship to the note F, not (as we are entitled to expect) to the E string. Similarly with  $K\lambda$ , employed to indicate B-C#:  $\lambda$ indicates a relationship to the note C, not to the B string, on which ex hypothesi the note concerned is played.3

It has, I hope, been shown that the working out of the hypothesis involves a number of difficulties, some more and some less serious. At point after point the expounders of the hypothesis are compelled to provide special explanations which are demanded rather by the phenomena of the notation than by the logic of the hypothesis or the practical probabilities. Those phenomena do not in most cases involve difficulties except on the supposition that the notation is a tablature. Though the purpose of this paper is primarily critical, it may be worth trying to show that the phenomena can be explained on a different set of suppositions, in my opinion with greater plausibility.

- (a) The most striking feature of the instrumental notation is the triads. In the *tonoi* which bear the same names as the octave-species,<sup>4</sup> the pycna are, with few exceptions, noted with complete triads. It is a reasonable working hypo-
- <sup>1</sup> The Hyperaeolian exhibits the same phenomenon an octave higher.
- <sup>2</sup> e.g. the tetrachord *meson* of the Hypoaeolian *tonos* in the diatonic genus:



The E-string triad is  $\Gamma L L$ , the F-string triad is  $\nearrow L \subseteq$ . See also the illustration in p. 177, n. 4.

- ³ When Gombosi finds the same combination used to note Cb-Db in the Hyperdorian, he postulates (Tonarten, p. 48) the use of both alternative strings. But is there any more reason for postulating it there than for B-C♯ in the Aeolian and Ionian (etc.)? Sachs (Rise of Music, p. 204) suggests that the reason for employing a C symbol was 'probably to avoid a chromatic interpretation': the reason seems hardly adequate.
- 4 i.e. the tonoi listed on p. 175 (disregarding the duplicates): the intervals of the octave-species are found in these tonoi between F

thesis that the notation was designed in the first place for scales which contained pycna, each pycnon to be represented by a triad. It may indeed have been designed for the enharmonic only and then adapted for use with all three genera. It was first designed for a limited number of tonoi. The degrees on which pycna were required together formed a regular diatonic series.

- (b) The crucial question is why, when the notation was used for the diatonic, the parhypatoeidē were noted with the same symbol as the chromatic and enharmonic parhypatoeidē, with the result that (as pointed out above) the F and C symbols are not used in the Hypolydian. It would be a good reason for so proceeding that in practice, or in the theory of those who devised the notation, the genera did in fact have a common parhypate. In the light of the scheme of chroai given by Aristoxenus, this does not seem plausible. But an earlier theorist, Archytas, whose formulas are recorded by Ptolemy, did give all three genera a common parhypate, and there is reason to suppose that his evaluations were related to actual musical practice.<sup>3</sup>
- (c) The SP symbols are used for parhypatoeide only. The TP symbols are used for oxypycna, but also where an 'accidental' is otherwise required. In the latter case they are used with an enharmonic (not a chromatic) value; they represent, that is to say, a note a semitone above that of the FP symbol. Thus, Dorian lichanos meson is noted 7 to give the note intermediate between the symbols F and C, i.e. between the (modern) notes G and A; Dorian mese is noted 3 to give the note intermediate between the symbols C and K, i.e. between the notes A and B.
- (d) Most of the pycna in the tonoi under consideration are based on 'naturals', i.e. they have as their lowest note a member of the basic diatonic series. Where the lowest note of the pycnon is an 'accidental', noted with a TP symbol (i.e. in the tetrachord synemmenon of the Dorian and in the tetrachords meson, synemmenon, hyperbolaion of the Mixolydian/Hyperdorian), a difficulty arises in noting the enharmonic. No symbol is available between this TP symbol and the FP symbol immediately above, which represents a note a semitone higher. The lower quartertone cannot be noted as such; it would seem that the upper quartertone was, therefore, abandoned. Instead, that is, of noting the oxypycnon with the SP symbol, the TP symbol was used. For instance, the pycnon of the tetrachord meson in the Mixolydian/Hyperdorian (which is the same as that of Dorian synemmenon) is noted: C K X. It is a form of notation appropriate to the chromatic, but not to the enharmonic.
- and F. It has generally been supposed that these tonoi were earlier than the intervening tonoi of the Ionian-Aeolian group. Gombosi, who believes that they were later, has to assume that the names originally borne by the 'low' tonoi were transferred at some stage to the 'high' tonoi, which were then renamed Ionian, Aeolian, etc. But, quite apart from the question of nomenclature, it is surely more probable that those tonoi whose notation is well adapted to the enharmonic genus are earlier than those whose notation is not.
- <sup>1</sup> Cf. Oxford Classical Dictionary, s.v. 'Music', 590, col. i. One can only speculate on the number and range of the tonoi for which the notation was originally designed,

- but Aristoxenus (see p. 180, n. 3) is evidence that the number of *tonoi* recognized was at first small.
- <sup>2</sup> And thus failed to provide a continuous series of quarter-tones—except where the semitones occur in the basic series.
- <sup>3</sup> Cf. Class. Quart. xxvi (1932), 195–208, esp. 202 f., 206 f. To what I have said there I will only add that Archytas' is the only mathematical evaluation of the enharmonic which dates from a period when the enharmonic was certainly alive.
- <sup>4</sup> Taking the illustration in p. 175, n. 4, the interval between FP and TP is a tone in the chromatic, but only a semitone in the enharmonic.

  <sup>5</sup> See n. 2 above.

- (e) The same problem arises with much greater frequency in the tonoi of the Ionian-Aeolian group, in which the pycna are mostly of this type. Where, however, the barypycnon happens to be a 'natural', the pycnon is noted with a complete triad. The instances are Ionian synemmenon, Hyperionian meson, synemmenon, and hyperbolaion. It will be observed that these stand in a symmetrical relationship to the 'exceptions' in the other group of tonoi, lying a semitone higher in each case.
- (f) If, as has generally been supposed, the tonoi of the Ionian-Aeolian group were added at a relatively late stage, the fact that their notation is ill fitted to the enharmonic genus may be no serious weakness, assuming that the genus was by then obsolete or obsolescent. It is of course anomalous that the Ionian and Hyperionian include pycna appropriate to the enharmonic, while the Dorian and Mixolydian/Hyperdorian include pycna appropriate only to the chromatic. The scope of these anomalies is, however, small, involving (apart from the tetrachord synemmenon) two tonoi only—the Mixolydian/Hyperdorian and the Hyperionian.<sup>2</sup>
- (g) Given an original diatonic series with a triad on each note, given common  $parhypatoeid\bar{e}$  for all three genera and common notation for chromatic and enharmonic, the system is worked out with perfect logic. The difficulties arise, first, from the fact that the system is based partly on function, partly on absolute pitch; secondly (and mainly) from the fact that the original scheme did not provide a complete series of quartertones.<sup>3</sup> It is an imperfect instrument and suffers from certain weaknesses, but its conventions were doubtless thoroughly well understood and gave rise to no difficulty in practice.

An account of the notation can be given on these lines. If an alternative account is produced which involves fewer and more plausible assumptions, no one will hesitate to adopt it. But I cannot feel that the 'pentatonic' hypothesis provides such an account. Naturally, if the 'pentatonic' interpretation of the instrumental notation breaks down (if the notation was based not on strings, but on notes), this does not disprove the hypothesis that the lyre was pentatonically tuned: it merely deprives it of its one substantial ground of support.

V. The practicability of the technique—or rather of the techniques, since Sachs and Gombosi offer different accounts of the way in which finger pressure was used to raise the pitch of strings—will be considered in a later section. Assuming that it was practicable, the tone and timbre of notes so obtained was likely to be different from the tone and timbre of notes obtained from the open strings. 'With its pentatonic accordatura, [the lyre] forced the player either to avoid certain notes or to produce them with the help of artificial devices difficult in technique and most probably unsatisfactory in timbre.' Sachs compares

<sup>&</sup>lt;sup>1</sup> See p. 178, n. 4.

<sup>&</sup>lt;sup>2</sup> Another anomalous effect of the scheme is that TP symbols occur as oxypycna in consecutive tonoi; for instance, J represents chromatic and enharmonic lichanos meson in both Aeolian and Lydian. If the symbol is given a chromatic value in the Aeolian and an enharmonic value in the Lydian, the equation is correct.

<sup>&</sup>lt;sup>3</sup> This is an additional reason for supposing that it was at first designed for a com-

paratively small number of tonoi. The fact that anomalies occur in the Mixolydian/ Hyperdorian may suggest that this tonos was not embraced in the original scheme. It may, therefore, be significant that the predecessors of Aristoxenus (Harm. 128. 6–23 Macran) were not agreed about the position of the Mixolydian tonos.

<sup>&</sup>lt;sup>4</sup> Sachs, Rise of Music in the Ancient World, p. 229. Cf. Reese, op. cit., p. 25.

the notes produced by 'stopping' to the pien-tones of Chinese pentatonic music, and the term is convenient. If the pien-tones were less resonant than the others, one would expect the character of a scale (and of the music played in it) to be greatly affected by the number, position, and function of the pien-tones employed; and it is in fact suggested by Gombosi and Reese that variations of this kind may have contributed to *ethos*. Little or no attempt, however, has been made to work out this idea in detail.

One general observation. These variations (if they really existed) belonged only to the music of the lyre and cithara. If music written in a particular genus in a particular tonos had a certain character owing to the distribution of pien-tones, then, when that same music was played upon the aulos, this character was presumably absent, unless (which is an extravagant supposition) the aulete tried deliberately to reproduce it. Now, although different ethos was attributed to different types of instruments, and although certain harmoniai were particularly closely associated with certain instruments, it is likely that all the principal harmoniai were played both on the aulos and on strings (and occasionally on both together).<sup>2</sup>

If, however, we confine our attention to the strings, we find some rather surprising phenomena. It would carry us too far afield to go into the controversial questions of tonality and modality. Gombosi holds that there was fundamentally one tonality only—that of the basic system with its structure of tetrachords bounded by 'standing-notes'—a tonality which can be described as Dorian, since the 'Dorian' octave is the kernel of the Greater Perfect System; he holds that the other octave-species were merely redistributions of the Dorian octave. I am not here concerned to controvert that view, which is supported by some, though not all, of the evidence.<sup>3</sup> In a paper read to the International Congress of Musicology at New York in 1939 Gombosi said: 'The interior tones of the tetrachords are rather variable in pitch, having no open string at their disposal but being produced artificially by pressure on a string sounding the lowest note of the tetrachord in question. So we do not wonder that ancient theorists like Aristoxenus discussed diverse chroai, or colours of pitch.'4 The statement in the first sentence is true on the hypothesis (of the enharmonic and chromatic and of the diatonic parhypatoeide), but it is only true in some tonoi. For the distribution of pien-tones pays no respect to the tetrachordal structure, nor could it do so, given the rigid system which is assumed. To consider only the fate of dynamic mese: it is a pien-tone (among 'high' tonoi) in the Dorian and Hyperdorian, (among 'low' tonoi) in the Hypoionian, Hypoaeolian, Aeolian, and Hyperaeolian. It is surprising, perhaps, that Dorian mese (to which such importance is attached) should be a pien-tone at all, and surprising

- <sup>1</sup> 'In lyre or kithara music, the fact that a tone produced by a stopped string would, in the absence of a fingerboard, be more muffled than a tone produced by an open string, may have had an effect on ethos' (Reese, op. cit., p. 45). Cf. Gombosi, *Tonarten*, p. 142.
- <sup>2</sup> The Phrygian was especially associated with the aulos, but Plato in the *Laches* (see p. 172, n. 5) implies that a lyre might be tuned to the Phrygian harmonia. Pindar also provides evidence: compare Ol. 5. 21 with Nem. 4. 44 f., and Nem. 3. 79 with Pyth. 2. 69.

Ptolemy seems to imply that the lyre-players employed all the seven *tonoi* of his theoretical system.

- <sup>3</sup> The evidence is examined in my *Mode* in Ancient Greek Music. See also Grove's Dictionary of Music and Musicians, 5th edition, iii. 774-9.
- <sup>4</sup> Papers read at the International Congress of Musicology, published by the Music Educators' National Conference for the American Musicological Society, New York, 1939, p. 181.

(if the distribution of pien-tones affected ethos) that it should be a pien-tone in the 'high' Dorian, but not in the 'low' (i.e. Hypolydian).<sup>1</sup>

Again, in some tonoi the proportion of pien-tones to open strings is exceedingly high, when one considers that the device was 'difficult in technique and most probably unsatisfactory in timbre'. The extreme examples are those enharmonic scales (see p. 177 above) in which only the mesopycna are played on open strings. This seems almost a reductio ad absurdum; and the reasonable conclusion to be drawn would be that the enharmonic was not in fact played in these tonoi (if the main hypothesis is correct). But the chromatic versions of these scales are hardly more plausible. In the case of the diatonic, it might be argued that the string-players avoided systems which involved an excessive number of pien-tones. This would have meant avoiding (for example) the 'high' Dorian and the Hyperdorian ('high' Mixolydian), which both have five pien-tones to three open strings.<sup>2</sup> It is true that the favoured cithara scales as given by Ptolemy involve a small number of tonoi and (in the 'low' tuning)3 a relatively simple scheme of 'Griffe', but Ptolemy seems also to imply that all his seven tonoi were employed on the lyre, the technique of which was ex hypothesi the same.

VI. Gombosi devotes a careful—and in many respects illuminating—discussion to the cithara scales of Ptolemy (second century A.D.), in the course of which he points out that the notes E-A-B-E, in the same intonation, are common to them all, the ratio of the central interval being 9/8 (i.e. it is a major tone). These are all ex hypothesi from open strings. The G and D strings also are used, in nearly every case, as open strings.<sup>4</sup> Now it is assumed by Sachs—and, I think, accepted by Gombosi—that the pentatonic accordatura of the lyre and cithara was achieved by means of consonances, with the result that the tones (G-A, A-B, D-E) were all major tones in the ratio 9/8. The intonation of the pien-tones was of course under the control of the player. Playing in the Dorian, for instance, he could with equal ease produce tetrachords in the 'ditonal' diatonic  $(256/243 \times 9/8 \times 9/8)$  and in the 'tonal' diatonic  $(28/27 \times 8/7 \times 9/8)$ . Not so, if the top interval of the tetrachord is other than a major tone (as in the 'tense' diatonic); not so in other tonoi, in which the standard tetrachords occupy different positions.<sup>5</sup> In Ptolemy's cithara scales, while the A-B interval required is always 9/8, the D-E interval varies: in Iastiaiolia and Hypertropa it is 8/7, in Lydia 10/9;6 similarly, the G-A interval is in four cases (Tropoi,

- <sup>1</sup> See p. 176, n. 3.
- <sup>2</sup> Gombosi, *Tonarten*, p. 27, suggests that the 'high' tuning came to be preferred because of 'der schärfere, hellere und stärkere Klang der angespannteren Saite'. But in the 'high' Dorian only three notes out of eight are on open strings and only these could have possessed a stronger tone.
- <sup>3</sup> Cf. Gombosi, *Tonarten*, 108 ff. On this assumption the evidence of Ptolemy can be brought into relation with that of Porphyry and Bellermann's Anonymus. Gombosi argues convincingly on this point. It is not correct, however, to suppose that Ptolemy, in his theoretical system, conceived his *tonoi*
- as 'low' tonoi. Rather, he regarded such a distinction as irrelevant. Gombosi's argument (op. cit. 99) is based on a misunderstanding of Ptolemy H., ch. 11 (65. 24 ff. D.).
  - 4 But not the G string in Iastiaiolia.
- <sup>5</sup> In the Hypodorian, for instance, the lower of the two standard tetrachords runs from F# to B. If G-A is fixed at 9/8, the inintonation will inevitably be that of the 'ditonal' diatonic. To obtain the 'tonal' diatonic, the G string must be lowered in pitch.
- 6 The correct nomenclature is given at 80. 18 D. At 39. 14, where the MSS. have λύδια καὶ ἰάστια, I suspect that we should read λύδια καὶ ἰαστζιαιόλ⟩ια.

Hypertropa, Tritai, Parhypatai), not 9/8, but 8/7. Either the strings, after a preliminary tuning by consonances, were readjusted or they were tuned in the first instance without the aid of consonances. A similar need for special tuning or retuning occurs in many connexions. To quote one further example, the Lydian, according to the Sterea intervals as given by Ptolemy for the lyre, requires a septimal tone (8/7) as the middle interval of the octave system; this means, in the 'low' tuning, a septimal tone between A and B, which are sounded ex hypothesi on open strings.<sup>3</sup>

The pentatonic hypothesis is not of course disproved by showing that a considerable amount of retuning of open strings might be involved in passing from one *tonos* to another. It does, however, seem progressively to lose its logic and coherence the more that current adjustments have to be made to the basic pentatonic framework.

VII. Finally, it must be considered whether the technique or techniques of fingering were practicable. And here it is not perhaps without significance that Gombosi, despite his firm adherence to the pentatonic hypothesis, came to the conclusion that the technique envisaged by Sachs was in fact impracticable upon the Greek lyres and citharas. We shall have to consider, therefore, both the original theory of Sachs, in the light of Gombosi's objections, and the theory substituted for it by Gombosi.

The evidence for the mode of playing on these instruments is partly literary, partly monumental. The literary evidence is scanty and not very clear; the monumental evidence, mainly in the form of vase-paintings, is plentiful, but its conventions are not always easy to interpret. The subject requires an extensive treatment of its own,<sup>4</sup> but even a superficial consideration reveals a few facts by which the hypothesis can be tested.

The left hand plucked the strings with the bare fingers. This is clear from the literary evidence and consistent with the prevailing artistic convention, which shows the fingers of the left hand spread across the strings.<sup>5</sup> The right hand generally used a plectrum. It has been suggested that a lute technique was employed by which the player swept across all the strings, perhaps simultaneously damping some of them with the fingers of the left hand. There is no positive evidence for this, and, even if such a technique was sometimes used, there is no doubt that the right hand was also employed, with or without plectrum, to sound individual strings, though what determined the distribution of functions between the two hands is not clear.<sup>6</sup>

Sachs's view is that the effective length of the string was shortened by finger pressure (as, for instance, on the violin). Considered in the abstract, this shortening could take place at either end of the string, below the cross-bar or

- <sup>1</sup> Gombosi (103, 105) calls attention to these ratios.
- <sup>2</sup> As implied by Porphyry, ad H. 126. 10 ff. D. (one of our rare pieces of direct evidence about tuning).
- <sup>3</sup> The false fourth and false fifth which the tuning involves occur between open strings.
- <sup>4</sup> Gombosi, *Tonarten*, 48 ff., 121 f., and M. Wegner, *Das Musikleben der Griechen*, furnish valuable catalogues of vase-paintings and other monuments containing representations

of lyre-type instruments.

<sup>5</sup> Whether or not the fingers of the left hand ever *damped* strings (as has been suggested), they certainly also *plucked* them.

<sup>6</sup> The passages relating to the Aspendius citharista (Cicero, II Verr. 1. 53; the scholiast ad loc.; the proverb in Zenobius 2. 30 and Plutarch, paroem. 120) are not so informative as we could wish, but imply that it was a tour de force to dispense entirely with the right hand.

above the bridge. Both regions were accessible to the right hand, in order to stop for the left. But the right generally held, and is represented as holding, the plectrum: it seems improbable that it was constantly dropping the plectrum (letting it swing on the cord?) in order to stop strings with the fingers and it is probably never represented as doing so. The left hand could not reach a point close to the bridge, because the body of the instrument was in the way. It might appear, however, that it could stop strings by pressing near the crossbar; and this, I take it, is what Sachs envisages. But the mobility of the left hand was restricted, as Gombosi and Wegner point out. Both lyre and cithara were held in position by a band attached to the left wrist. This band allowed the fingers to reach the middle region of the strings, but not (it is clear) the neighbourhood of the cross-bar.

Thus neither was the left hand able to stop for the right nor (probably) the right hand for the left. Gombosi further states that 'strings as thin as those of the lyre instruments can be stopped only by being pressed against a stable and hard object; for want of a fingerboard, only the cross-bar could serve this purpose'. And the cross-bar could not be reached with the left hand. Unable to accept Sachs's view, yet convinced that the lyre and cithara were pentatonically tuned, Gombosi advances a different theory. The pitch of the strings was raised, not by decreasing their length, but by increasing their tension; and this was done by pressing with the plectrum between the bridge and the fastening, i.e. on the non-sounding part of the string. He quotes the analogy of the Japanese koto, which is treated in a similar manner, one hand plucking the strings, the other raising their pitch, as necessary, by pressure below the bridge. It is assumed that before the introduction of the plectrum the fingers were used in ancient Greece also and that this method was occasionally employed in later times.

As positive evidence that this manner of playing was current in ancient Greece Gombosi can only point to certain vase-paintings (one of which he reproduces) in which the right hand is shown in the position it would have to occupy in order to perform the operation in question. Now the position of the right hand in the numerous paintings of lyre-players and citharodes varies greatly. Sometimes it is well to the right of the instrument, sometimes below the instrument, sometimes between the instrument and the spectator's eye but not near the strings, and so on. Is it an excess of scepticism to suggest that some paintings were likely to show the hand (and plectrum) against the strings between the bridge and the fastening, by mere chance or because this suited the composition of the painting, and not because the player was engaged in a specific musical operation? On the Brygos amphora in Boston it looks as though the plectrum were inserted between two strings. This may be just an accident of drawing (and I believe it is); it may represent the operation which Gombosi supposes. If a substantial number of paintings could be shown to convey a

- <sup>1</sup> The citharist, for instance, on the Munich crater (3268—Wegner, pl. 22) is tuning the instrument? But see p. 186, n. 1.
- <sup>2</sup> Cf. Gombosi, *Tonarten*, p. 119, and pp. 179 ff. of the paper referred to on p. 184, n. 4; Wegner, *Musikleben*, p. 33. This is very clearly shown, for the cithara, on the London hydria (B 300—Wegner, pl. 8); for the lyre, on the Berlin Duris cup (Pfuhl, *Masterpieces*, no. 65).
  - <sup>3</sup> In order to raise the pitch by a major

tone, the string length must be decreased by a ninth, and I do not see how in fact the cross-bar could be effectively used in this operation. But on these technical matters the non-expert hesitates to speak. It seems highly probable that, if strings were in fact stopped without a fingerboard, the tone would at least be very poor: the poorer the tone, the more weight attaches to the objections raised in Section V.

similar impression, this might outweigh the probability that the position of the plectrum is due to chance or to artistic considerations. Meanwhile, the few examples given provide a weak support for the theory, on which the following comments may also be made.

- (a) If the right hand was able to perform this function in aid of the left, the service could not be returned. It follows that the right hand (with or without plectrum) could only play on open strings. This is a serious objection in music which ex hypothesi makes so much use of pien-tones. It can only be met by whittling down the functions of the right hand as regards the playing of notes. But it is not plausible to carry this process too far. The plectrum  $(\pi\lambda\hat{\eta}\kappa\tau\rho\sigma\nu)$  was, after all, an article for 'striking' the strings, and we are not justified in supposing that its main function was to press them.
- (b) The cithara projected at right angles from the body of the performer, who was generally standing, and the strings were easily accessible to his right hand throughout their entire length. The lyre and barbiton, on the other hand, were often played by a seated performer, who held the instrument tucked into his left hip. One cannot assert that in this case it was impossible for him to reach the strings between bridge and fastening and to operate upon them with precision, but this part of the strings was so close to the body (and to the clothing) that the technique would seem to be most awkward. Yet it must ex hypothesi have been employed upon these instruments no less than upon the cithara.
- (c) On Sachs's view, the SP and TP symbols of the triads indicate a difference of fingering, not of string-length and pitch. The TP symbol is used, not only for the Ganztongriff, but frequently also for the Halbtongriff. Gombosi cannot, therefore, equate the two symbols with two degrees of pressure (which would give a logical, though perhaps unparalleled, basis for a notation<sup>2</sup>): he too must relate the symbols to fingering. I understand him to mean that, for the Ganztongriff, pressure was exercised by both the index and middle fingers; that, for the Halbtongriff, pressure was exercised either by the index finger alone (if the next lowest string was also modified) or by the middle finger alone (if the next lowest string was played open); that the TP symbol was used, if the index finger was involved either alone or in combination with the middle finger.<sup>3</sup> Why it should have been technically necessary or convenient to use the index finger for the Halbtongriff, simply because the next lowest string also required modification, is by no means clear.<sup>4</sup> But that is not the chief difficulty. The plectrum, as we are told by Philostratus<sup>5</sup> and can see from vase-paintings, was firmly gripped  $(\partial \pi \rho i \xi)$ ; and the normal grip, sometimes shown with the index finger outstretched along the top, was presumably sufficient for the greater degree of pressure required for a Ganztongriff. It is far from clear that the addition of the middle finger would have been necessary or helpful. What is quite clear is that the use of the middle finger *alone* (for exercising the pressure) conflicts entirely with the manner of holding the plectrum which is shown in the vase-paintings.6

plies when he says (*Tonarten*, p. 120): 'wenn das Plektron über zwei Saiten quergelegt werden mußte'.

<sup>&</sup>lt;sup>1</sup> Cf., e.g., Hom. Hymn to Apollo, 184 f.; Pindar, Nem. 5. 24; Eur. Her. 350.

<sup>&</sup>lt;sup>2</sup> The Japanese have technical terms for single and double pressure.

<sup>&</sup>lt;sup>3</sup> As noted on p. 177, there seems to be an exception to this rule.

<sup>4</sup> I am not quite sure what Gombosi im-

<sup>&</sup>lt;sup>5</sup> Philostratus minor, *Imag.* 6 (400. 25 Kayser).

<sup>&</sup>lt;sup>6</sup> It is not clear that the technique would be any more appropriate to the use of the

It would appear, then, that both the methods which we have been considering involve technical difficulties. As I stated at the beginning of this article, I am aware of the difficulties which the orthodox view—one string, one note—itself involves, and I am not concerned to argue that in no circumstances was any such technique employed. It may be that the Greek virtuosi, especially from the late fifth century onwards, succeeded in overcoming the difficulties to the extent of occasionally supplementing the open strings with a note of thinner tone obtained by stopping. (For it seems more likely that, if employed at all, it was a genuine technique of stopping than the koto technique envisaged by Gombosi.) But it is indeed hard to believe that stopping or other finger pressure was employed systematically and to the extent implied by the pentatonic hypothesis as inferred from the instrumental notation. That hypothesis itself, as I trust I have shown, rests upon extremely insecure foundations.

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fingers without plectrum. In any case the use of the plectrum was normal from a period which must long antedate the notation.

<sup>I</sup> Cf. F. Behn, Musikleben im Altertum und frühen Mittelalter, p. 89. Since writing this article, I have seen a RF cup in Mykonos

Museum (KZ 1402), representing a player with his left hand on the strings and his right hand on the cross-bar, as on the Munich crater (see p. 184, n. 1). The fact that his mouth is open suggests that he is playing rather than tuning his instrument.



The Music of Pindar's "Golden Lyre"

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# THE MUSIC OF PINDAR'S "GOLDEN LYRE"

#### J. F. MOUNTFORD

MONG the major losses inflicted by the passage of time we must count the disappearance of the music which formed an essential part of the art of the Greek lyric and dramatic writers. Of the tragedians' music there remains only a pitiably mutilated scrap of a chorus from the *Orestes* of Euripides; whether we possess a genuine specimen of the music of the lyric poets or merely an audacious forgery is the problem discussed in this article.

In 1650, on page 541 of Volume I of his Musurgia universalis,<sup>1</sup> Athanasius Kircher, a learned and well-known Jesuit, published a text of the first few lines of Pindar's first Pythian ode with suprascript Greek musical signs; on page 542 both the text and the signs were reprinted underneath a line for line transcription into modern musical notation. The authenticity of this musical fragment has, at various times during the last three centuries, been blindly accepted, attacked, defended, or silently rejected; but no unanimously agreed conclusion has been reached.<sup>2</sup> The question has recently been reopened with vigor by A. Rome for the prosecution<sup>3</sup> and by Paul Friedländer<sup>4</sup> for the defense; both writers draw attention to points of fresh interest but neither, I think, takes all the pertinent factors into full consideration. The problem is somewhat intricate and can be properly studied only if we take the evidence point by point in a judicial and unbiased spirit. As a necessary preliminary to the discussion, readers may care to inspect the following copy of Kircher's text and melody:

<sup>&</sup>lt;sup>1</sup> Athanasii Kircheri, Musurgia universalis, sive ars magna consoni et dissoni in X libros digesta (2 vols.; Romae: Corbelletti, 1650); pp. 690+462.

<sup>&</sup>lt;sup>2</sup> E.g., the fragment is included by Curt Sachs in his *Musik des Altertums* (Breslau: Jedermanns Bücherei, 1924), and by M. Emmanuel in his article on Greek music in Lavignac's *Encyclopédie de la musique* (Paris, 1924); but it is not to be found in von Jan's *Musici scriptores Graeci* (Leipzig, 1895), or in his *Supplementum* (1899), or in Th. Reinach's *La musique grecque* (Paris: Collection Payot, 1926).

<sup>&</sup>lt;sup>3</sup> "L'origine de la prétendue mélodie de Pindare," Les études classiques, I (1932), 3-11.

<sup>4 &</sup>quot;Die Melodie zu Pindars erstem pythischen Gedicht," Berichte über die Verh. d. Sächs. Akad. d. Wiss. zu Leipzig, phil.-hist. Kl., Band LXXXVI, Heft 4 (Verlag von S. Hirzel, 1934). Pp. 54.

e' e' d' c' b e' d' c' b a b Xρυ-σέ-α φόρ-μιγξ, 'A-πόλ-λω-νος καὶ ἰ-ο-πλο-κά-μων

c' b a b c' d' c' d'  $\sigma$   $\dot{\nu}\nu$ -δι-κον Μοι-σ $\hat{a}\nu$  κτ $\hat{\epsilon}$ -a-νον,

e' d' c' b d' c' b c' d'[?] a b a  $\tau$   $\hat{a}$ s  $\hat{a}$ -κού-ει μὲν βά-σις  $\hat{a}$ -γλα- $\hat{i}$ -as  $\hat{a}$ ρ-χ $\hat{a}$ .

c' c' b c' d' e' d' c' b  $\pi \epsilon l - \theta o \nu - \tau a \iota \delta$ ,  $\delta$   $\delta$  -  $o \iota - \delta o \iota$   $\sigma \delta - \mu a - \sigma \iota \nu$ ,

$$\begin{cases} c' & b \\ g & c' \end{cases} a \quad d' \quad e' \quad d' \quad c' \quad b \quad a \quad b \quad a$$

$$\kappa a \lambda \tau \partial \nu \quad a \lambda \chi - \mu a \tau \dot{\alpha} \nu \quad \kappa \epsilon - \rho a \nu - \nu \dot{\alpha} \nu \quad \sigma \beta \epsilon \nu - \nu \dot{\nu} - \epsilon \iota \varsigma.^{5}$$

T

The whole problem takes its rise from the fact that the manuscript from which Kircher says he took the piece was never reported by anyone else and cannot now be traced. Kircher announced his discovery in the following words:

Inueni autem hoc musicae specimen, vt alias memini in celeberrima illa totius Siciliae Bibliotheca monasterij S. Saluatoris iuxta Portū Messanensem in fragmēto Pindari antiquissimo, notis musicis Veterum Graecorum insignito, quae quidem notae, siue characteres musici cum ijs, quos Alypius in tono Lydio exhibet sunt ijdem; Verba Odes Pindaricae notis musicis Veteribus vsitatis expressa sequuntur; tempus non notae; sed quantitas syllabarum dabant [p. 541].

The abbey mentioned by Kircher was founded in the eleventh century; but it no longer exists, and most of its manuscripts have gone

<sup>&</sup>lt;sup>5</sup> I have corrected sheer misprints in Kircher's text, but shall return to them later. To avoid the use of musical type I employ italic letters, and to avoid the use of accidentals I have set the melody one tone higher than Kircher did in his transcription. The double melody in ll. 6 and 7 will be discussed later. The time-values which Kircher gave to the notes will also be mentioned subsequently. Both Rome and Friedländer print mechanically produced facsimiles of the pertinent parts of Kircher's two pages.

to the University of Messina.<sup>6</sup> It had a scriptorium and, quite naturally, devoted some attention to church music;<sup>7</sup> but there is no reason to suppose that it was either more or less likely than any other ecclesiastical institution to possess works on ancient music or actual scores of ancient musical compositions.<sup>8</sup> If Kircher had said simply in fragmento Pindari we might, after some hesitation, have accepted the suggestion that he found the passage embedded in a treatise on ancient music or appended to such a work.<sup>9</sup> But his actual words, in fragmento Pindari antiquissimo, would more suitably be used to describe something less than a complete codex; and if his source were only a single leaf or two,<sup>10</sup> it would be easy to imagine circumstances in which it may have been mislaid or destroyed. One may fairly claim, I think, that in Kircher's account of his discovery there is nothing<sup>11</sup>

- <sup>6</sup> For the history of the foundation and for the present whereabouts of its MSS see Rome, op. cit., p. 4 n., and Friedländer, op. cit., pp. 13-16, and the literature there cited.
- <sup>7</sup> The account of the abbey written by the second abbot mentions γραμματικούς τε καὶ καλλιγράφους καὶ διδασκάλους τῶν θείων βιβλίων, and τοὺς τὴν μελφδημάτων ἐκκλησιαστικῶν ἐκπαιδευθέντας ἀκρίβειαν (cf. Friedländer, op. cit., p. 13).
- 8 In his Dissertation sur la mélopée de l'ancienne musique (1729), Burette quoted a note made by Montfaucon on the library: πολλὰ δὲ ἄλλα βιβλία περιέχουσι τὰ πάντα περὶ τοῦ χοροῦ. Though Burette realized that the note must refer to choir books, he thought the Pindar piece might have been found among them. This appears to me highly improbable (cf. Rome, op. cit., p. 5).
- <sup>9</sup> Friedländer writes (op. cit., p. 14): "Eine Schrift über antike Musik etwa, in der sich die Noten zu Pythien I am besten denken lassen, kann das Kloster sehr wohl besessen haben." But there is no actual evidence that the abbey ever did possess a copy of an ancient musical treatise; and none of the extant treatises illustrates any of its points by excerpts from ancient compositions. The Anonymi scriptio de musica published by Bellerman (1841) contains a few very brief passages in ancient notation to illustrate types of melodic progression; but, being clearly fabricated for this special purpose and not taken from "standard" works, they afford no support for Friedländer's suggestion. The hymns of Mesomedes (cf. von Jan, Mus. scr. Gr., pp. 454–59, and Suppl., pp. 40–59) are preserved as separate items in MSS which contain several other treatises besides; but Kircher's words do not justify the supposition that he found his fragment in a composite codex.
- <sup>10</sup> Since Kircher is admitted by all to have been only a poor Greek scholar, such a leaf must have contained some hint that the words were those of Pindar; Kircher probably would not have recognized the fact from his own knowledge.
- <sup>11</sup> In the passage of Kircher quoted above, the words *vt alias memini* have sometimes been quoted as a ground for suspicion, because Kircher does not refer elsewhere to this particular discovery. He had, however (on p. 213), mentioned this same monastery in connection with his discovery of a book of medieval hymns accompanied by medieval musical notation; and we know from his autobiography that in 1637/8 he did go to Malta and Sicily. It seems reasonable to explain *alias memini* as a somewhat inexact cross-reference made by a voluminous and hasty writer (cf. Friedländer, *op. cit.*, p. 12).

which is demonstrably impossible; but when a fundamental document is not available for inspection, an alleged copy of it can be accepted as trustworthy only after it has been subjected to the most rigorous tests available.

H

The first point which is made evident from an examination of Kircher's pages is that, whatever the source of the music may be, Kircher did not take the text of Pindar from his manuscript; for, as a whole, and at a vital point, his text coincides with the text published by Erasmus Schmid in 1616. 12 In place of προοιμίων Schmid proposed and printed  $\tau \hat{\omega} \nu \phi \rho o \iota \mu \iota \omega \nu$ ; this reading, which has not found any favor with later editors, appears (with the misprint  $\tau \partial \nu$  for  $\tau \partial \nu$ ) in Kircher. 13 It would be futile to argue that Kircher may have obtained the reading not from Schmid but from the same source as his melody; for, apart from its inherent improbability, such a supposition would at once be rebutted when one noticed that the Latin translation which Kircher printed on page 541 immediately beneath the Greek text is (except for misprints)<sup>14</sup> identical with that of Schmid. No one has seen Kircher's musical manuscript; but everyone can see whence he obtained his Greek text. In such circumstances it is not only reasonable but inevitable that a most damaging charge should be preferred against him: it may be suggested that he simply took Schmid's text, composed a melody of his own for it, transcribed that melody into Greek notation (of which he had some knowledge), and boldly claimed to have found it in a fragmentary manuscript in a distant library. Nevertheless, there is some weight in the plea of Friedländer that, if Kircher actually found a scrap of Greek music, it would not be unnatural for one, whose knowledge of Greek (as all admit) was not good, to avail himself of all the help a recently printed text of Pindar seemed to afford. This dependence upon Schmid certainly proves that

<sup>12</sup> The Greek text of Kircher, both on p. 541 and on p. 542, contains gross errors: φόρμιηξ and φόρμινξ for φόρμιγξ; πείδονται (twice) for πείθονται; σάμα σὺν (twice) for σάμασιν; αγησιχόρον (twice) for ἀγησιχόρων. Whether the errors are due to Kircher's own miscopying of Schmid or to faulty proof correction does not matter; in either case Kircher is to blame.

<sup>&</sup>lt;sup>18</sup> Rome, who seems to have been the first to notice these coincidences, gives facsimiles of the pertinent pages of both Kircher and Schmid (op. cit., pp. 4, 7, 9).

<sup>14</sup> E.g., obtemperans for obtemperant.

Kircher did not exercise that respect for primary sources that would be expected of a modern scholar, and it may lead us to wonder whether his report of the Greek musical signs can, in any case, be trusted; but, in itself, it is not conclusive evidence of dishonesty.

#### III

The comparison with Schmid can be carried a step farther. Kircher's fragment ends with a definite musical cadence at σβεννύεις, although the sense in Pindar runs on into the next line. Now σβεννύεις is the very last word of the text on page 18 of Schmid's edition. The presence of the musical cadence at that word does not provide an argument against authenticity; for σβεννύεις forms the end of a rhythmical  $\kappa \hat{\omega} \lambda o \nu$ , and it is reasonable to suppose that, where there is a conflict, the music would be allied to the meter and rhythm rather than to the sense. But what are we to think of the relation between the extent of Kircher's text and music and the disposition of the ode in Schmid's pages? A defense of Kircher's honesty must here be based either on our belief in a very remarkable coincidence or on the supposition that Kircher, thinking that he had printed enough for his immediate purpose, deliberately jettisoned at this point whatever else remained of the musical setting in that fragmento antiquissimo. Within the range of possibility, if not of probability, either of these explanations may contain the whole truth; but each of them, and especially the first, savors of special pleading when confronted with the prosecution's simple suggestion that Kircher, intent upon a forgery, hurriedly copied a piece of Greek from the oldest lyric poet readily available to him, and, in his comparative ignorance of the language, did not trouble to turn Schmid's page. 15

# IV

As far as  $\dot{\alpha}\rho\chi\dot{\alpha}$  (= four lines of Schmid's text),<sup>16</sup> the Greek vocal notation is given; the remainder of the fragment (= four lines of Schmid)

<sup>&</sup>lt;sup>15</sup> There was a catchword (which does not appear in Rome's facsimile, op. cit., p. 9) at the foot of Schmid's page; but, even if Kircher noticed such a commonplace feature of book production, it would provide no incentive for him to turn over. Furthermore, the sense of Schmid's line-for-line translation appeared to end at the foot of its page, despite the lack of a punctuation sign.

<sup>16</sup> Schmid's first line ends with 'Απόλλω-; and so χρυσέα to ἀρχά occupies four lines.

is in the Greek instrumental notation. There is no parallel among our extant fragments for this alternation of the two systems of musical signs within a single composition.<sup>17</sup> In defense of Kircher, Friedländer has urged that, if we had more remains of ancient music, we might find a precise parallel to this admixture of the two notational systems. But here, undoubtedly, a very strong argument can be adduced on the other side. Notice the circumstances in which Kircher introduces his fragment. After he has given a table containing both the vocal and the instrumental signs he says (p. 541):

Porrò exhibitis Veterum Graecorum characteribus, nihil amplius restat, nisi ut & specimen quoddam hoc loco exhibeamus Veteris Musicae; praesertim cum nullus, quod sciam hucusque id praestiterit, resque uti incognita, ita & desideratissima sit; Ex hoc siquidem clare apparebit, quae ratio modusque in compositionibus faciendis à Veteribus fuerit vsurpatus.

The fragment itself is amazingly apposite to its context; for, within a conveniently small compass, it shows both sets of signs in use, and, on the basis of Schmid's lines, in equal proportions. Does it display a cynical view of human nature to claim that the discovery was too good to be genuine, and that the peculiar features of the notation of Kircher's fragment are most easily explained if we regard the whole thing as a forgery?

V

Above the iota of  $\dot{a}\gamma\lambda a\dot{t}as$  Kircher prints no Greek musical sign, and in the transcription only three notes are set to the word. It is odd that the omission of a note occurs just at the one word in the fragment, and just at that place in the word, where someone, who knew little Greek and was concocting a melody, might unsuspectingly display his ignorance of the number of syllables involved. One obvious line of defense is to suggest that the omission is due to a defect in

<sup>17</sup> The instrumental signs (if such, indeed, they are) which are found in the *Orestes* fragment (cf. von Jan, *Mus. scr. Gr.*, pp. 427-31, and *Suppl.*, pp. 4-7) are not set to any words of the text. The instrumental excerpts preserved in the Berlin papyrus have no relation to the vocal compositions with which they alternate; see my discussion in Powell and Barber, *New Chapters in Greek Literature* (2d ser.; Oxford, 1929), pp. 146-83.

<sup>18</sup> Schmid printed the iota with a sign of diaeresis; but Kircher, who copied the text very carelessly, may easily have passed it over and noticed only the accent. Kircher's knowledge of quantity and meter was negligible, as may be seen from his transcription where diphthongs are set to short notes and short syllables to long notes in a pell-mell fashion.

Kircher's manuscript; but this would still involve acceptance of the coincidence. Or it may be suggested that the omission of a sign over a syllable was a conventional indication that it was to be sung to the same note as the preceding syllable; but elsewhere in the fragment, when contiguous syllables are sung to the same note, the musical sign is repeated; and so the coincidence remains. On the whole, it must be admitted, the point goes against Kircher. On the whole, it must be

Before passing to the discussion of the next few points, which, as we shall see, do not provide us with conclusive or corroborative arguments either for or against authenticity, it will be convenient to pause and consider to which side the balance of evidence inclines. Quite apart from the disappearance of the manuscript, Kircher's adoption of Schmid's text has to be explained; the extent of the fragment, viewed in its relation to Schmid's pagination, has to be explained; the admixture of notations and their relation to Schmid's arrangement of the text have to be explained; and the defective notation for άγλαΐας has to be explained. For each one of these difficulties a more or less adequate explanation can be advanced; but in such a combination of suspicious circumstances, whose importance as evidence is not only individual but cumulative, a series of separate explanations provides a defense whose strength is to be measured by its weakest part, and which grows feebler with every addition to the series. It is no frivolous charge that the defenders of Kircher are called upon to answer, and it is not sufficient for them to wave aside one item of the indictment after another; they can now secure a verdict only by bringing forward some positive proof of authenticity which in itself will justify their explanations of difficulties and make those difficulties appear quite unimportant or irrelevant.

VI

The musical signs used in the fragment, as Kircher himself states, are all taken from the two-octave scale known technically as the

<sup>19</sup> It is only in the Delphic hymns (cf., e.g., von Jan, Mus. scr. Gr., suppl., pp. 8-34) that repeated notes are not indicated by a repetition of the sign; and there the practice is quite consistent and the few apparent exceptions are due to lacunae in words and music

<sup>&</sup>lt;sup>20</sup> The hymns of Mesomedes (which are in vocal notation) were published by Vicenzo Galilei in 1581, but without a transcription into modern notation. It would be unfair to ask why Kircher did not transcribe them, because there is no evidence that he knew of their existence.

Lydian  $\tau \acute{o}\nu os$ . Now the Lydian happens to be the first of the  $\tau \acute{o}\nu os$  described in the treatise of Alypius, and is consequently the first  $\tau \acute{o}\nu os$  in the table of musical signs which Kircher printed on page  $540.^{21}$  If the prosecution's case is accepted on other grounds, we may be ready to believe that Kircher selected the Lydian  $\tau \acute{o}\nu os$  for the convenience of a reader who might wish to compare the signs employed in the Pindar fragment with those set out in Kircher's tables. But this particular circumstance ought not to be used as an argument against Kircher; for the instrumental notation of this same Lydian  $\tau \acute{o}\nu os$  is used in the second Delphic hymn.

# VII

Kircher explains his idea of the method of performance thus (p. 541):

Vides in hoc specimine duos choros, vnum vocalem, quo vox praecedens canonem recitat iuxta notas verbis singulis superscriptas; Hunc sequitur Chorus alter, qui non erat aliud, quam Cytharaedus, vel Aulaedus priori  $a\nu\tau i\sigma\tau\rho o\phi os$ , qui secundū [sic] stropham instrumento exhibebat; vt in infra posito exemplo, clarè patet.

In partial conformity with this passage he prints Chorus Vocalis on page 541 above the first part of the fragment  $(\chi\rho\nu\sigma\dot{\epsilon}a-\dot{\epsilon}\rho\chi\dot{a})$ , and Chorus Instrumentalis above the second part  $(\pi\epsilon\dot{\imath}\theta o\nu\tau\alpha\dot{\imath}-\sigma\beta\epsilon\nu\nu\dot{\nu}\epsilon\iota s)$ . But when, on page 542, he repeats the signs and text with a transcription, he varies his rubrics: above the first part he prints the words Monophonia, sine vox praenia; and above the second part, ' $\chi\dot{o}\rho\sigma s$   $\epsilon\iota s \kappa\nu\theta\dot{a}\rho\sigma\nu$ ' (sic) at the left, and Chorus ad Cytharam at the right. There were, then, according to Kircher, two chori, but the first was monophonia and the second cytharaedus vel aulaedus; into such a

<sup>21</sup> See the edition by von Jan, *Mus. scr. Gr.*, pp. 359–406. The relation between Kircher's table and Alypius will be discussed later.

22 In actual fact, such a comparison would have been quite impossible, owing to two egregious blunders: (a) In the instrumental notation the real sign for τρίτη συνημμένων (which is used ten times in the second half of the melody) does not appear in the table, but in its place the sign of μέση (which also is used ten times in the fragment) is erroneously repeated. (b) At the left-hand side of the table Kircher prints Roman letters to be used as a clue for transcription; but the clue given for συνημμένων διάτουος (which occurs fourteen times in the melody) is a semitone too low, and the clue for νήτη συνημμένων (which occurs nine times) is a whole tone too low. These errors crept in during the final preparation of the sheets for the press or during the process of printing. The relation between the signs printed over Kircher's text and their transcription proves that Kircher's own copy of the table must have been without these particular defects.

farrago it is not possible to bring order and clarity.<sup>23</sup> But what lies behind it? Rome takes the view that Kircher, having in mind the liturgical practice of his own day, intended to present his fragment as a solo followed by a full chorus with instruments, and gave as antique a flavor to his preliminary remarks and rubrics as his knowledge allowed. This interpretation, however, would be valid only as a possible explanation of some features of an exposed forgery; it is not a proof of anything. On the other hand, Friedländer emphasizes the lack of clarity and consistency in Kircher's remarks and regards them as the efforts of an honest, but puzzled, discoverer to account for the change of notation and for the words ' $\chi \delta \rho os \epsilon \kappa \theta \delta \rho a \nu$ .'<sup>24</sup> He thus ingeniously suggests that in this very uncertainty there is a proof of authenticity. But such an argument cannot carry conviction unless we accept the proposition that a man's ignorance is an unfailing testimony to his honesty.<sup>25</sup>

#### VIII

There are musical cadences at (io) πλοκάμων, κτέανον, ἀρχά, σάμασιν, φροιμίων, (ἐλελι) ζόμενα, and σβεννύεις—that is to say, at the end of each of Schmid's lines except the first, which ends with the third syllable of ' $\Lambda \pi \delta \lambda \lambda \omega (\nu o s)$ . Since metrical κῶλα end at these places, we cannot dogmatically assert that they were not melodically marked by Pindar, and that in consequence Kircher could only have obtained

- <sup>23</sup> If we may judge from the transcription, Kircher thought the two parts were of equal length; for, at the expense of quantities, he manages to squeeze each half into the space of 108 crotchets.
- <sup>24</sup> In conformity with his support of Kircher, Friedländer takes  $\chi \dot{o} \rho o s$  εις κυθάραν as a genuine direction copied by Kircher from his MS, and considers its omission on p. 541 as accidental. The general method of performance he explains thus (p. 40): "Der Einsatz der Instrumentalnoten, auf den die griechische Bemerkung  $\chi o \rho \dot{o} s$  είς κυθάραν aufmerksam macht, ist nicht beliebig. Er stimmt zu den Worten des Dichters. Als der Chor die Phorminx ansingt, geht der Gesang unbegleitet. Als es heisst: 'es gehorchen die Sänger den Zeichen,' setzt die Phorminx ein." Apart from Kircher's remarks, there is no evidence for this opinion about the mode of performance, and to me it seems that such a patchwork treatment would ill befit the dignity of Pindar's style.
- <sup>25</sup> No more than a footnote need be devoted to H. A. J. Vincent's remarkable interpretation in his "Notice sur trois manuscrits grees relatifs à la musique," Extraits et notices des manuscrits de la Bibliothèque du Roi, XVI, Part II (1847), 157. There the second half of Kircher's melody is set out as a counterpoint concurrent with the first, but only at the expense of an arbitrary repetition of certain of Kircher's notes and a disregard for Greek quantities.

a hint of this kind of musical structure from the arrangement of the lines in Schmid.

# IX

There is no difference between Kircher's Greek notation on page 541 and that on page 542; but his own transcription on page 542 at  $\dot{\epsilon}\lambda\epsilon\lambda\iota\zeta\delta\mu\epsilon\nu\alpha$   $\kappa\alpha\iota$   $\tau\delta\nu$  does not correspond with those signs. In this discrepancy we have another proof of Kircher's carelessness, but no test of authenticity. If Kircher wrote the melody himself, he became muddled in applying the Greek signs; if the melody is genuine, he erred in transcribing.

 $\mathbf{X}$ 

If we seek for an objective test of the melody on musical grounds, our chief, and indeed our only, criterion on the Greek side must be the passage of the pseudo-Aristotelian *Problems* (xix. 20) where it is stated that all good melodies make a frequent use of a note called Mese: πάντα γὰρ τὰ χρηστὰ μέλη πολλάκις τῆ μέση χρῆται. Whether by Mese the writer meant the fourth note ascending in any octave scale or ἀρμονία, or whether he meant the central note in the twooctave scales known as τόνοι, is a matter of controversy. But the other fragments of Greek music seem, on the whole, to indicate that in a diatonic melody the fourth note ascending in the octave scale on which the melody is based was used as a tonal center or focus.<sup>27</sup> The Pindar piece does not fill a full octave; its limits are e' and g. If the underlying scale is assumed to be e'-e, it will be noticed that the important cadences at  $\dot{a}\rho\chi\dot{a}$  and  $\sigma\beta\epsilon\nu\nu\dot{\nu}\epsilon\iota s$  end on a, which is the fourth note ascending in that octave.<sup>28</sup> On the other hand, the note b, which appears frequently as the lowest note of the short descending phrases, and occurs several times at the end of κώλα, represents the Mese or

<sup>&</sup>lt;sup>26</sup> The transcription does not imply the use of any new signs, but only a different sequence of those given. In the facsimile printed above, the lower line of notes represents Kircher's Greek signs and the upper line his transcription.

 $<sup>^{27}</sup>$  See my discussion of this point in New Chapters in Greek Literature (2d ser., 1929), p. 167.

<sup>&</sup>lt;sup>28</sup> Whether the note between the lower e and the g would have been a natural or a sharpened f is a matter of conjecture. If the f were natural, the modal octave would be Greek Dorian; if it were sharpened, the mode would be Greek Hypodorian. Actually within the notation of the Lydian  $\tau \acute{o} \nu os$  there would be no means of indicating a natural f.

central note of the  $\tau \dot{\nu} \nu \sigma$ s employed.<sup>29</sup> Whichever way the remark of pseudo-Aristotle is interpreted, it could be applied to the Pindar piece. We know too little about ancient musical practice to claim that the melody must be Greek; but there is no item of our knowledge which would justify anyone in asserting that this melody could not be Greek. On the other hand, some writers have felt that the melody is reminiscent of plainsong. This feeling is not without a real foundation in fact;<sup>30</sup> for the melody can be regarded as an example of the first Gregorian mode, in which the prominent e' would be the "dominant" and the scarcely less important a would be the "final." Nevertheless, until we have a much larger corpus of Greek music, it is dangerous to argue from any preconceived notion that Greek music could not, in some ways, have resembled other types of music known to us. Musical tests do not, in fact, provide us with any means of deciding the issue.

#### XI

It is now time to consider a line of defense which Friedländer has been the first to adopt.<sup>32</sup> In the course of a very detailed analysis of the melody he draws attention to the following points: (a) that the melodic line is generally descending; (b) that the first note of each  $\kappa \hat{\omega} \lambda o \nu$  is higher in pitch than the last note of the preceding  $\kappa \hat{\omega} \lambda o \nu$ ; (c) that each separate word is set to a descending phrase except at the end of a  $\kappa \hat{\omega} \lambda o \nu$  where there is the rise and fall of a musical cadence, and at other places where the word itself has a special significance; (d) that the musical phrases, being adapted to the run of the words, effect in

- <sup>29</sup> In his edition of Alypius, von Jan follows the modern convention established by Bellermann and transcribes the Lydian  $\tau \acute{o}\nu os$  as a scale commencing on d. For convenience, throughout this article I have considered it to be a tone and a half lower; see the footnote appended to my copy of Kircher's text and melody given above.
- <sup>30</sup> Rome (op. cit., p. 8) writes: "Il a écrit une phrase de plain-chant du xviie siècle—le plain-chant des messes de Dumont." This remark, however, is not intended to indicate a definite source; for the author tells me that he chose the name of the musician Dumont (b. Maestricht, 1610) as one which would be well known to his Belgian readers, and whose general style of composition would serve as an illustration.
- $^{31}$  On this interpretation the basic scale would be a' to a, with the f' sharpened. The g, which is used twice in comparatively unimportant places, would be the note below the "final." See also A. Rome, Les études classiques, 1935, p. 341.
- <sup>32</sup> See especially his sections entitled "Examinatio" (pp. 24-29); "Wortsinn und Melodie" (pp. 32-40); "Metrum und Melodie" (pp. 42-47).

most cases a caesura and only rarely a diaeresis in relation to the metrical structure of the  $\kappa \hat{\omega} \lambda \alpha$ ; (e) that the short syllables of a dactyl are treated in the melody as if they belonged together. Friedländer's argument from these observations is that the melody shows evidence of design, that such a design could not be due to one so ignorant as Kircher (or, indeed, due to anyone except Pindar himself), and that the melody must therefore be accepted as authentic. The first and vital thing is to inquire whether Friedländer's major premise is justified by his observations. Is the design a reality or a fancy? For, unless the presence of a design is proved right up to the hilt, the whole argument fails. (a) There is no particular significance in a descending melody, unless it can be shown that such a progression is either peculiar to Greek melody or much more common there than elsewhere; no such doctrine is justified by our evidence.<sup>33</sup> (b) It is not true that all κῶλα commence on a higher note than that on which the preceding κῶλον ended, unless we follow Friedländer in accepting Kircher's transcription as the real melody, and in rejecting the Greek signs at ἐλελιζόμενα καὶ τόν as a series of misprints. The rejection, even at one place, of the Greek signs, which must be treated as the primary documentary evidence, inevitably throws doubt on the accuracy of all the others, even when they correspond with the transcription. In this way Friedländer undermines the whole fabric. (c) When Friedländer suggests that the rising phrases at the words  $Moi\sigma \hat{a}\nu$ , άγλαΐας, ἀοιδοί, ἀμβολάς, and αἰχματάν are intended as a musical counterpart to the special significance of those words, many readers

<sup>33</sup> Gevaert (Histoire et théorie de la musique de l'antiquité [1875], I, 378) also argued in favor of Kircher on the basis of a similar observation. The theory that in Greek melody descending progressions were predominant is derived from two pieces of evidence: (a) Ps.-Aristotle (Prob. xix. 33) inquires διὰ τί εὐαρμοστότερον ἀπὸ τοῦ ὀξέος ἐπὶ τὸ βαρὺ ἢ ἀπὸ τοῦ βαρέος ἐπὶ τὸ ὀξύ; but the sequel (πότερον ὅτι τὸ μὲν ἀπὸ τῆς ἀρχῆς γίνεται ἄρχεσθαι; ἡ γὰρ μέση καὶ ἡγεμὼν καὶ ὀξυτάτη τοῦ τετραχόρδον) shows that the writer has in mind not so much melodies as the theoretical structure of scales; and I agree with Gevaert (Problèmes musicaux d'Aristote [1903], p. 173) that the passage takes its rise from the physiological fact that it is easier to sing downward than upward. (b) The series of alphabetical signs used for the vocal notation was applied from the top of a scale downward, so that A is a higher note than Ω; but obviously this usage was determined by the theory of scale-structure. On the other side, it must be emphasized that there is no statement in any of our authorities that actual melodies composed by practical musicians showed a preference for a downward progression; and the fragments of Greek music which we possess show no such tendency.

will suspect that he is indulging in a piece of special pleading.<sup>34</sup> No small part of the artistry of a writer like Pindar consists in the unfailing selection of significant words, and in the avoidance of what is otiose or commonplace; and if there were rising phrases set to  $\phi \delta \rho \mu i \gamma \xi$ , σύνδικον, άγησιχόρων, it would require little ingenuity to excogitate reasons why they should have been chosen for special treatment. Friedländer seems to have realized the weakness of his position; for he seeks to show that, in the other strophes and antistrophes, especially important words are placed in positions corresponding to those occupied by the selected words in Kircher's fragment. But this analysis does nothing to support his doctrine; too many of the alleged parallelisms are unconvincing.<sup>35</sup> Finally, if we are the least bit skeptical about Friedländer's interpretation of these rising phrases, is it not pertinent to ask whether they are not a natural consequence of the general melodic progression: a melody cannot descend for ever! (d) The avoidance of diaeresis, which is a tendency but not an inviolable rule within the range of the fragment, 36 is fundamentally a matter of Pindaric metric. If the music is genuine it would teach us that the poet-composer arranged his melodic line in accordance with the words rather than with the meter. But if Kircher wrote the melody, he would naturally adapt his musical phrasing to the grouping of the words, since he was too ignorant of meter to do anything else; and the result would be just the kind of musical structure which Friedländer attributes to Pindar. Indeed, this examination of the phrasing brings to light an important piece of evidence: the musical line clearly phrases  $\mu \dot{\epsilon} \nu$  not with  $\dot{\alpha} \kappa o \dot{\nu} \dot{\epsilon} \iota$ , which precedes, but with  $\beta \dot{\alpha} \sigma \iota s$ , which follows.<sup>37</sup> If the grouping is to be regarded at all, this feature of it is most reasonably regarded as the ignorant handiwork of Kircher. (e) In actual fact, the musical treatment of the two short syllables of a dactyl does not differ from the treatment of other quantitative se-

<sup>34</sup> It is a weakness in his argument that he claims no significance for the rising phrase at  $\tau \epsilon \dot{\nu} \chi \eta s$ .

 $<sup>^{35}</sup>$  E.g., the parallels he quotes (p. 35) for Moισâν are κρατί, παγαί, στρωμνά, ψυχ $\hat{q}$ , στάθμας, μείων, πολλών.

<sup>36</sup> Thus there is diaeresis after ἀοιδοί and κεραυνόν (cf. Friedländer, p. 45).

<sup>&</sup>lt;sup>37</sup> Friedländer has, of course, observed this point (p. 46); but I find his treatment of it unsatisfactory, because he does not face the difficulty squarely.

quences; it is pure fancy to pretend otherwise.<sup>38</sup> In this matter of design, the onus of proof is on him who makes it the basis of his argument; and, without the least desire to belittle the ingenuity and literary sense to which Friedländer's observations are due, I submit that there are too many legitimate objections for us to accept the doctrine proposed.<sup>39</sup>

# XII

Such internal evidence as can be extracted from the fragment has now been examined; it remains for us to consider briefly the extent of Kircher's knowledge of Greek music and his reputation as a scholar. It is strange that those who have discussed the Pindar fragment should not have made more than a passing mention of Kircher's knowledge of the Greek musical notations. The text of Alypius, which is the foundation of our information on this topic, had been published in 1616 by Meursius, but the actual musical signs, which accompany the text in the manuscripts, were not printed. It was Kircher himself who first published tables of the Greek signs. On page 540 he says: "Has notas iniuria temporum vindicatas singulari DEI beneficio tandem in duobus manuscriptis quorum unum in Bibliotheca Vaticana, alterum in nostra Collegij Romani asservatur, deprehendi."40 The whereabouts of the manuscript which Kircher says was in the Collegium Romanum is not known, and no one seems to have inquired which of the Alypius manuscripts in the Vatican was the one Kircher may have used. The matter is not of great importance, however; for if one looks at the tables of the signs for the diatonic and chromatic

<sup>&</sup>lt;sup>38</sup> Thus καὶ l-,  $-\pi$ λοκά(μων), κτέα(νον), βάσις, are set to falling phrases; but so are φόρμιγξ and κεραν(νόν). The two shorts in ἀγησιχόρων and ὁπόταν are set to the same note; but so are the first two syllables of χρυσέα and πείθονται. The setting of ἀγλαΐας is deficient, and that of ἐλελιζόμενα is uncertain; but, in any case, they would introduce no new principle.

<sup>&</sup>lt;sup>39</sup> Friedländer (pp. 47-52) also examines the relation of melody to word accent and finds that no general principle emerges. He could scarcely have expected it to be otherwise, if the main principle is that of descending progression and the exceptions thereto are determined (as he holds) by the semantic importance of certain words.

<sup>&</sup>lt;sup>40</sup> A little later he says: "Edidit itaque hic Alypius integrum volumen de characteribus, sive notis musicis, una cum aliis Veterum Musicorum manuscriptis in Collegij Romani Bibliotheca superstitibus, quod ex Graeco in latinum à nobis translatum, oportuniori tempore forsan seorsim, si DEO libuerit, Reipublicae literariae exhibebimus." The translation seems never to have been published.

genera which Kircher gives, it will be noticed that the blank spaces left by Kircher agree in a remarkable manner with the gaps which, as von Jan states in his apparatus to Alypius, occur in the oldest of our Alypius manuscripts (M, Ven. Marc., app. class., VI, 10).41 Furthermore, von Jan<sup>42</sup> declares that the shapes of Kircher's signs are very similar to those found in a Leipzig codex. Another striking fact is that although Kircher mentions notas veterum secundum tria genera (p. 540), that is, diatonic, chromatic, and enharmonic, his tables contain only diatonic and chromatic scales. It happens that all manuscripts of Alypius are defective, and out of fifteen enharmonic τόνοι they contain only six complete and three incomplete. It is quite obvious that in this matter Kircher cannot be accused of any malpractice. He found the enharmonic scales incomplete and omitted them entirely; the gaps in the other tables he did not fill in. 43 If Friedländer had noticed these facts and their implications, he might have made a strong plea. Here, he might have said, is an instance where we can test Kircher's reliability in the matter of Greek music; though one of the manuscripts he mentioned cannot be traced, and the other

<sup>41</sup> The details are these: Kircher, like M, omits both the instrumental and the vocal signs for Phrygian diatonic παραμέση, Hyperphrygian diatonic νήτη συνημμένων, Hyperlydian chromatic λιχανὸς μέσων. Kircher, like M, omits one of the signs for Hypodorian diatonic τρίτη συνημμένων; it is apparently the instrumental sign which is given, though it appears in Kircher's table in the vocal column. In the Dorian chromatic, M gives to τρίτη διεζευγμένων the signs for παρανήτη διεζευγμένων, which was accidentally omitted; in the Hypodorian chromatic, M gives to ὑπάτη ὑπάτων the signs of  $\pi \alpha \rho \nu \pi \dot{\alpha} \tau \eta \dot{\nu} \pi \dot{\alpha} \tau \omega \nu$ , which was omitted accidentally; and in both these scales there are identical mistakes in Kircher. On the other hand, the instrumental sign of Hypoaeolian diatonic  $\pi a \rho v \pi \dot{a} \tau \eta \dot{v} \pi \dot{a} \tau \omega v$ , which M omits, is found in Kircher. In this same scale the signs which Kircher gives for the tetrachord ὑπερβολαίων are dislocated just as are the text and signs of M. Two important errors in Kircher have no parallel in M: (a) in the Hyperphrygian diatonic Kircher skips the signs for τρίτη διεζευγμένων and secures a complete scale only by the repetition of  $\tau \rho i \tau \eta \ \dot{\nu} \pi \epsilon \rho \beta o \lambda a i \omega \nu$ ; (b) in the Dorian diatonic most signs are misplaced because of the omission of the proper signs for παρανήτη ὑπερβολαίων, and the full scale is secured only by the intrusion of a new pair at  $\pi$ αρυ $\pi$ άτη ὑ $\pi$ άτων. Both these errors I attribute to Kircher's MSS. In many of the details of shape Kircher is at fault, and on that ground, as well for his omission of the whole enharmonic genus, he is mercilessly attacked in the Preface to M. Meibom's Antiquae musicae auctores septem (Amsterdam, 1652).

<sup>42</sup> Mus. scr. Gr., p. 359, n. 1.

<sup>&</sup>lt;sup>43</sup> The complete system of Greek musical signs is so intricate that Kircher would have found enormous difficulty in filling up the lacunae in his tables without reference to a more complete and accurate MS of the Greek text than those he used. I do not wish to suggest that he would have silently filled up the gaps if he could; I merely want to indicate that the use of a given series of signs is, or would be, an easier matter than the completion of a defective series.

is unidentified, nevertheless it can be shown that his statement must be trustworthy; and, in the matter of lacunae, where there may have been a temptation to go beyond his positive evidence and indulge in legitimate conjecture, he preferred to give his readers only that for which he could definitely vouch; and, in view of this striking testimony to his honesty, ought not the explanations which are adduced for the problems of the Pindar fragment to be accepted, and ought not Kircher's honor to be vindicated and the fragment welcomed gladly as a genuine relic of Pindar's music? To that defense the proper answer would seem to be that a definite charge of forgery must be decided primarily by considerations relating to the specific document concerned; a man's character enters into such questions to this extent, that his proved honesty ought to save him from frivolous accusations; but proved dishonesty in some other similar matter adds considerably to the force of the prosecution's case. Kircher was a polymath; he interested himself in a great variety of subjects, including mathematics, physics, oriental languages, and Egyptology, on all of which he published large volumes embodying the results of his studies. No one now takes the trouble to read his mathematics and physics; but his work in Egyptology has been assessed by no less an expert than A. Erman.<sup>44</sup> His judgment is unequivocal; for he not only designates Kircher as a charlatan, but points to definite instances of his falsification of evidence. 45 Any good impression which has been created by a study of Kircher's treatment of the tables of musical signs is shattered by this independent opinion of his honesty in scholarly matters. 46

<sup>&</sup>lt;sup>44</sup> Allgemeine Deutsche Biographie, XVI, 1-4.

<sup>46</sup> Erman says: "Um den Lesern der 'Lingua aegyptiaca restituta' doch etwas bieten zu können, was seinen Versprechungen entspricht, greift er zu Fälschungen"; and later; "Ich bin auf diese Arbeiten Kircher's näher eingegangen, weil mir daran lag, ihn als den Charlatan zu zeigen, der er war." This judgment is the more important since Erman seems not to know of the suspicions aroused by the Pindar fragment. When speaking of Burette's opinion of Kircher (vir immensae quidem, sed indigestae admodum eruditionis), Friedländer says (p. 10): "Dies Urteil und das meiste, was man sonst über ihn gesagt hat, ist doch gesagt aus einem Wissenschaftsbegriff, der nicht der seine war." And in his reference to Erman's judgment he says (p. 10, n. 4): "Zweifle ich nicht, dass Kircher gegen die wissenschaftliche Genauigkeit gesündigt hat, wohl aber, ob Ermans Urteil historisch angemessen and damit in höherem Sinne gerecht ist." But the whole point is whether Kircher's Wissenschaftsbegriff included honesty.

<sup>46</sup> Attention may here be called to an article ("Kircher und Pindar," Hermes, LXX [1935], 101-6), by P. Maas and J. Müller-Blattau, which appeared after my discussion was written. Maas (pp. 101-2) briefly stresses the evidences against Kircher which I have mentioned in paragraphs II, III, IV, V, and VII above; he considers Kircher's rubric (χόρος εις κυθάραν) a fabrication, for it betrays the pronunciation of Latin chôrus.

It would be of great interest and importance to classical scholarship if we could say that there is in existence the original music for almost the whole of a strophe of Pindar. In this article I have set forth, as fairly as I can, the facts of the case and the arguments which can be advanced on either side. Readers have the material on which to form their own opinions; and, unless I entirely misjudge the balance of the evidence, their verdict will be that the case for the defense is hopeless, and that Kircher stands convicted of having deliberately misused his knowledge and skill in an attempt to foist an audacious forgery upon the world.<sup>47</sup>

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a faulty translation of ad ( $\epsilon$ is for  $\pi \rho \delta s$ ), and the false spelling cythara; the deficient setting of  $\dot{a}\gamma\lambda atas$  he relates to the pronunciation aglaja; but he does not discuss Friedländer's argument from design. Müller-Blattau, who deals with the musical side of the problem (pp. 102-6), makes three principal points: (i) He shows that the "transcription," when analyzed in relation to the bar lines which Kircher himself printed, is musically coherent in itself, and that it employs rhythms common in German music of the sixteenth and seventeenth centuries. The point, however, is not decisive; for I see nothing in the musical coherence which could not be a matter of Pindaric technique, and the rhythmical parallels only show that, in his ignorance of Pindaric metric, Kircher (whether forger or ill-equipped transcriber) fell back upon rhythms which seemed natural to him. (ii) M.-B. quotes examples to prove that the melody in Kircher's version is similar in style to sixteenth-century archaizing settings of Horatian odes, which would be familiar only to a German; but comparisons instituted between styles as simple as these under discussion are often illusory, and the underlying argument assumes that no style of Greek music could have resembled anything which came later. (iii) M.-B. finds similar melodic and rhythmical formulas in other pieces of music which Kircher admittedly wrote to illustrate various points in the Musurgia; but here again the comparison is concerned with relatively simple styles; and such similarities as exist between the Pindar "transcription" and the several pieces referred to by M.-B. do not appear to me sufficient to prove that Kircher must have been the composer of the melody. So far as strictly musical arguments are concerned, the authenticity of the fragment is not disproved by showing merely that Kircher might have written it; that could only be effected by a demonstration (hitherto unattempted) that it violates some canon of ancient musical theory or practice and therefore could not be Greek. Müller-Blattau's parallels, however, are a useful indication that the melody need not be Greek and that it is compatible with a charge of forgery.

<sup>47</sup> The most recent literature of the subject is as follows. Among reviewers of Friedländer's pamphlet, W. Vetter (*Zeitschr. für Musikwissenschaft*, 1935, pp. 121 ff.) and W. Fischer (*Philolog. Wochenschr.*, 1935, pp. 965 ff.) are favorable; E. Kalinka (*Philolog. Wochenschr.*, 1935, pp. 961 ff.), R. P. Winnington-Ingram (*Jour. Hell. Stud.*, 1935, pp. 264 f.), and J. F. Mountford (*Cl. Rev.*, 1935, pp. 62 f.) are unfavorable. In "Pindar ou Kircher," *Les études classiques*, 1935, pp. 337–50, A. Rome replies to Friedländer and defends some details of his earlier article. In "Pindar oder Kircher," *Hermes*, 1935, pp. 463–71, Friedländer discusses the objections raised by his critics and attacks Erman's opinion of Kircher; and in the same article (pp. 472–75) H. Birtner criticizes the musical arguments of Müller-Blattau.



The Innovations of Lysander the Kitharist

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# THE INNOVATIONS OF LYSANDER THE KITHARIST

Φιλόχορος δ' ἐν γ΄ 'Ατθίδος Λύσανδρος, φησίν, ὁ Σικυώνιος κιθαριστής πρῶτος μετέστησε τὴν ψιλοκιθαριστικήν, μακροὺς τοὺς τόνους ἐντείνας καὶ τὴν φωνὴν εὕογκον ποιήσας, καὶ τὴν ἔναυλον κιθάρισιν ἡ πρῶτοι οἱ περὶ 'Επίγονον ἐχρήσαντο. καὶ περιελὼν τὴν συντομίαν τὴν ὑπάρχουσαν ἐν τοῖς ψιλοῖς κιθαρισταῖς χρώματά τε εὕχροα πρῶτος ἐκιθάρισε καὶ ἰάμβους καὶ μάγαδιν, τὸν καλούμενον συριγμόν καὶ ὄργανον μετέλαβεν μόνος τῶν πρὸ αὐτοῦ, καὶ τὸ πρᾶγμα αὐξήσας χορὸν περιεστήσατο πρῶτος.

(Athenaeus, Deipn. 637-8)

Since Epigonus spent most of his life in Sicyon, it seems likely that Lysander was himself one of the associates of Epigonus that the passage mentions. This would place him in the latter part of the sixth century. But we have no further information about Lysander, and nothing of what is known of Epigonus is any help in the interpretation of the present account. Some innovations in kithara-playing are being credited to Lysander, but what they are is far from clear.  $\mu \alpha \kappa \rho o \dot{\nu}_S \tau o \dot{\nu}_S \tau \delta v o v \dot{\kappa}_S \kappa \alpha \dot{\nu}_S \tau \dot{\gamma}_V \phi \omega v \dot{\gamma}_V \epsilon \dot{\nu}_O \gamma \kappa o \nu \eta \sigma \alpha s$  plainly indicates that he increased the sonority of the instrument, perhaps, as the Loeb translator (Gulick) suggests, by augmenting the size of the sound-box; but the rest of the passage is distressingly mysterious.

I shall not try to elucidate all the difficulties in detail. I shall concentrate on three points, the significance of (a) the expression ἔναυλον κιθάρισιν, (b) the sentence χρώματά τε εὕχροα πρῶτος ἐκιθάρισε καὶ ἰάμβους καὶ μάγαδιν, τὸν καλούμενον συριγμόν, and (c) the phrase ὅργανον μετέλαβεν. (I see no good reason to doubt that the text is sound.)

- (a) The expression  $\tilde{\epsilon}\nu\alpha\nu\lambda$ os  $\kappa\iota\theta\acute{a}\rho\iota\sigma\iota$ s occurs nowhere else, as far as I know. According to LSJ it means 'kithara-playing accompanied by the aulos'. This is linguistically possible, but difficult in the context, since the subject in hand is explicitly designated as  $\psi\iota\lambda$ o $\kappa\iota\theta$ a $\rho\iota\sigma\tau\iota\kappa\acute{\eta}$ , the art of solo performance on the kithara. It is true that elsewhere  $\psi\iota\lambda$ os, 'bare', is used primarily to distinguish solo instrumental performance from the combination of instrument and voice;² the use of the term  $\psi\iota\lambda$ o $\kappa\iota\theta$ a $\rho\iota\sigma\tau\iota\kappa\acute{\eta}$  to admit the combination of kithara and aulos is therefore not ruled out, but it would certainly be unexpected. For this reason Gulick has offered the translation 'giving that flute-like tone to strings...'; but (leaving aside the traditional misrepresentation of the aulos as a 'flute') this is surely impossible. The kithara, no matter how loudly or sonorously it is plucked, remains a plucked instrument, and cannot conceivably reproduce the sustained nasal blare or the lascivious whine of the aulos (a shawm or oboe, not in the least like a flute). What the phrase really means will be considered later.
- (b) I must also postpone discussion of the expression  $\chi\rho\dot{\omega}\mu\alpha\tau\alpha$  εὖχροα. Our understanding of the whole passage will turn on the interpretation of the words  $l\dot{\alpha}\mu\beta\sigma\nu$  καὶ  $\mu\dot{\alpha}\gamma\alpha\delta\nu$ , τὸν καλούμενον συριγμόν, and these must be considered first. Since  $\mu\dot{\alpha}\gamma\alpha\delta\nu$  is the name of an instrument, it has commonly been assumed that these

<sup>&</sup>lt;sup>1</sup> On Epigonus see Athenaeus 183d, Pollux 4. 59, Aristoxenus, El. Harm. 3. 23-4.

<sup>&</sup>lt;sup>2</sup> e.g. Plato, Laws 669e, Aristotle, Pol. 1339b20.

words constitute a list of instruments to which Lysander could turn his hand. The Loeb translator seems to suppose that there are three such instruments mentioned, 'iambi, the magadis, and the syrigmus, as it is called'; and he glosses 'syrigmus' as 'a kind of whistle'. But the linguistic construction that a list of three demands seems improbable, and Kaibel's treatment of τον καλούμενον συριγμόν as being in apposition with  $\mu \dot{\alpha} \gamma \alpha \delta w$  is evidently correct. In that case, however, if a syrigmus is a kind of whistle, the μάγαδις referred to cannot be the stringed instrument usually called by that name.3 It will have to be the rather dubiously authenticated variety of aulos whose claim to the name  $\mu \dot{\alpha} \gamma \alpha \delta \iota s$  is discussed at Athenaeus 634c ff.; but nothing in that passage or elsewhere makes the identification of this  $\mu \dot{\alpha} \gamma a \delta \iota_s$  with a  $\sigma \nu \rho \iota \gamma \mu \dot{\rho} s$ in the least likely. (Athenaeus' disputants are not even certain that such a μάγαδις ever existed: note that the passage of Philochorus is not among those cited in their attempts to provide evidence that it did.) Again, what are 'iambi'? They may be any of several things, but  $ia\mu\beta os$  is never used as the name of an instrument. Kaibel therefore suggested the emendation  $i \alpha \mu \beta \dot{\nu} \kappa \eta \nu$ , the name of a little known instrument mentioned at Athenaeus 636b, and by a couple of other later authors.4

All this is fairly unsatisfactory, the more so when it is noticed that  $\sigma\nu\rho\iota\gamma\mu\delta$ s has the unmistakable form of a noun representing an activity. It means, as LSJ says, a whistling or hissing noise; as the name of an instrument it would be a most awkward coinage. If that is correct, and if  $\sigma\nu\rho\iota\gamma\mu\delta\nu$  and  $\mu\delta\gamma\alpha\delta\iota\nu$  are in apposition,  $\mu\delta\gamma\alpha\delta\iota\nu$  cannot here refer to an instrument either.  $i\delta\mu\beta\sigma\nu$ s never looked as though it did.

The passages that give the clue, I think, to a proper reading of the paragraph, are tolerably well known, but so far as I am aware have not been connected with it by modern commentators. The first is Pollux 4. 84, which gives the famous description of the Pythikos nomos, a piece for solo aulos in five sections or movements. As a whole, the nomos represented the battle between Apollo and the Python, and it was evidently highly imitative and expressive. It is relevant to our present concern that the third movement is given the title laμβικόν: this, according to Pollux, was the movement that depicted the sounds of the actual combat. But to suggest, without more evidence, a connection between this occurrence of  $la\mu\beta\iota\kappa\delta\nu$  and  $lά\mu\beta\delta\nu$  in the present passage would be more than hazardous, not least because the piece described by Pollux is an auletic nomos (i.e. a piece for the aulos alone), in which the kithara played no part. A different account of the same nomos appears, however, at Strabo 9, 421-2. Describing the early history of the Pythian games, he says  $\pi \rho o \sigma \epsilon \theta \epsilon \sigma a \nu \delta \epsilon \tau o i s$ κιθαρφδοῖς αὐλητάς τε καὶ κιθαριστὰς χωρὶς ῷδῆς, ἀποδώσοντάς τι μέλος, ὃ καλεῖται νόμος Πυθικός. He goes on to give the titles of its five movements: his version differs from that of Pollux, and in it the fourth movement is called ἴαμβοι καὶ δάκτυλοι, the fifth σύριγγες. Of these the former, he tells us, represents the ἐπιπαιανισμόν following Apollo's victory, the dactylic rhythm being appropriate to hymns of praise (υμνοις), the iambic to insults (κακισμοῖς). The latter, σύριγγες, represents the death-throes of the monster, as it breathes its last in τινὰς συριγμούς.

I suggest that this repetition of Philochorus' association between  $ia\mu\beta oi$  and  $\sigma\nu\rho_i\gamma\mu_0i$  is unlikely to be a coincidence. It is admittedly not clear from Strabo's account whether the *Pythikos nomos* was played on kithara and aulos together, or sometimes on kithara, sometimes on aulos. In view of Pollux's assertion that it is an

<sup>&</sup>lt;sup>3</sup> For the stringed magadis see esp. Athenaeus 634e ff., and cf. Pollux 4. 61.

<sup>&</sup>lt;sup>4</sup> Pollux mentions it in a list of stringed instruments, giving no further information. In Hesychius it is not even obvious that a distinct kind of instrument is meant: *iambykai* are described merely as 'instruments to which they sang *iamboi*'.

auletic nomos, it seems most likely that it was always performed on a solo instrument, that its original and proper instrument was the aulos, and that its performance on the kithara was a later and derivative innovation. If that is correct, it is a plausible hypothesis that it is precisely this innovation that Philochorus has attributed to Lysander. Alternatively, and perhaps more probably, Philochorus intended no specific reference to the *Pythikos nomos* (if he had, he might have been expected to name it), but only to musical effects of the type from which the last two movements of that nomos, on Strabo's account, take their names. Lysander may not have played the *Pythikos nomos* itself, but he recreated on the kithara some of the imitative tricks which this nomos had made its speciality.

As to the word  $\mu \dot{\alpha} \gamma \alpha \delta \iota \nu$ , I would argue that the sense is not that Lysander performed on an instrument of that name, but that he produced on the kithara the musical effect most commonly associated with that instrument, as also with the verb  $\mu \alpha \gamma \alpha \delta i \zeta \epsilon \iota \nu$ ; that is, the effect of playing or singing in octaves, or of reproducing a tune an octave higher. 5 As an 'effect' on the kithara it would be created by lightly stopping the strings with the plectrum or the finger-nails, a well-known way of generating harmonics. 6 This would take the kithara high above its familiar range, and would yield a noticeably thinner tone, quite appropriately described by the term συριγμός.<sup>7</sup> It is true that the noun μάγαδις itself seems always to be used elsewhere as the name of an instrument, not that of a musical effect. But we have a clear parallel for the present usage in a passage of Xenophon (Anabasis 7. 3. 32-3): σάλπιγξιν ώμοβοείαις ρυθμούς τε καὶ οἷον μαγάδιδι σαλπίζοντες. Here the general sense of the last phrase must be 'playing the salpinx (trumpet) on high harmonics'; literally 'playing the salpinx as though playing on the magadis'. Todd translates 'playing upon trumpets...music like that of a harp', which has no clear meaning: but Gulick has it right ('flageolet notes') in his version of the passage as quoted by Athenaeus (151e). Athenaeus has the reading οἷονεὶ μάγαδιν σαλπίζοντες, which provides an even closer parallel with the account of Lysander: the sense is 'as it were playing the magadis on the salpinx'. Thus though it is the musical effect that is being described, the term  $\mu \dot{\alpha} \gamma a \delta \iota s$  may still be allowed to retain, at a literal level, its role as designating an instrument. The quotation from Xenophon strongly suggests that  $\epsilon \kappa \iota \theta \acute{a} \rho \iota \sigma \epsilon \mu \acute{a} \gamma a \delta \iota \nu$ , 'he played the magadis on the kithara', would be a perfectly possible way of saying 'he played the kithara in such a way as to produce notes at the higher octave'.

In view of all this, I see no reason to interpret the expression  $\chi\rho\dot{\omega}\mu\alpha\tau a$   $\epsilon\ddot{v}\chi\rho\sigma a$  as a technical reference to 'chromatic' tunings, or forms of the scale.8 What Lysander had done was to make the kithara, for the first time, an instrument capable of 'realistic' imitative effects, in constrast to the usage whereby it merely sounded a tune or an accompaniment without substantial variation of tone-colour. (This more traditional usage is characterized here by the word  $\sigma vv\tau \sigma \mu i a$ , literally 'conciseness', but suggesting 'simplicity' or 'plainness' of style.)  $\chi\rho\dot{\omega}\mu\alpha\tau a$   $\epsilon\dot{v}\chi\rho\sigma a$  are vivid colourings, exemplified in the representation of the battle with the Python. Such colourings may indeed have been associated with the chromatic scale: this is hinted at by the scale's name, though other derivations are canvassed in the ancient sources; but in that case

<sup>&</sup>lt;sup>5</sup> For this use of μαγαδίζειν see ps.-Aristotle, Problems 19. 919 a 1, 921 a 30.

<sup>&</sup>lt;sup>6</sup> For the technique see e.g. C. Sachs, *The History of Musical Instruments* (London, 1942 and 1977), p. 188, cf. p. 275.

<sup>&</sup>lt;sup>7</sup> μάγαδις and συριγμός are taken in this sense by S. Michaelides, *The Music of Ancient Greece* (London, 1978), p. 196 and pp. 313–4, following Gevaert.

<sup>&</sup>lt;sup>8</sup> For analyses of the varieties of chromatic scale see Aristoxenus, El. Harm. 50. 25-51. 11.

the origin of the technical name must lie in an earlier non-technical sense of  $\chi\rho\hat{\omega}\mu\alpha$ , which is common enough, and of which the present phrase gives an example.

Returning now to  $\tilde{\epsilon}\nu a \nu \lambda \delta s$   $\kappa \iota \theta \acute{a} \rho \iota \sigma \iota s$ , we can see how to allow it to mean 'playing the kithara in the manner of an aulos' without suggesting that the kithara was made to sound like an aulos, which it cannot. The aulos was always a highly emotional instrument, capable of a wide range of expressive effects. (Hence, in part, the hostility to it expressed by Plato.) The Pythikos nomos was invented for it, and exploited fully its dramatic possibilities. Thus in performing a version of this nomos on the kithara, or creating on the solo kithara some of the effects for which that nomos was best known, Lysander could fairly be said to have created a form of kitharism that copied, or was like, the playing of the aulos.

(c) Our final question concerned the sense of the phrase  $\delta\rho\gamma a\nu\sigma\nu$   $\mu\epsilon\tau\dot{\epsilon}\lambda a\beta\epsilon\nu$ . Gulick translates 'could substitute one instrument for another', and this is almost correct: but it is ambiguous. In view of his apparent belief that the list discussed in (b) is a list of instruments, Gulick probably means that Lysander could play instruments of several kinds, and employ one or another as he thought fit. This, I think, is wrong: what the phrase means is not that he could, but that he did substitute one instrument for another, in the sense that he played on one, the kithara, types of music which had previously been performed only on the aulos, and to which the aulos continued to be thought more appropriate.

These hypotheses receive some support from Athenaeus' next sentence.  $\Delta i \omega v a \delta \epsilon \tau \delta v X \hat{\imath} \delta v \tau \delta \tau \delta \hat{\imath} \delta \epsilon \delta \hat{\imath} \delta v \lambda \hat{\imath} \delta v \delta \hat{\imath} \delta$ 

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<sup>&</sup>lt;sup>9</sup> The forms of expression most frequently associated with chromatic tunings are sweetness and plaintiveness. See e.g. Anon. Bell. 26, cf. Aristoxenus, El. Harm. 23. 1–24. For  $\chi\rho\hat{\omega}\mu\alpha$  in the sense 'expressive colouring', see e.g. Plato, Rep. 601 b, Antiphanes ap. Athenaeus 643d.

<sup>10</sup> Association of the aulos with Dionysus, e.g. Euripides, Bacchae 127–8, 380; with spondeia e.g. ps.-Plutarch, De Mus. 1135a, Pollux 4. 79, 81; and cf. the terms σπονδαυλεῖν, σπονδαύλης.



When Is a Harp a Panpipe? The Meanings of  $\pi\eta\kappa\tau\acute{\iota}\varsigma$ 

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# WHEN IS A HARP A PANPIPE?

THE MEANINGS OF  $\pi\eta\kappa\tau$ is

From the Archaic period to the sixth century A.D., as well as in later Byzantine lexica, we find numerous instances of the word  $\pi\eta\kappa\tau i_S$  as the name of a musical instrument. It occurs in some 78 passages: enough, one might suppose, to establish its meaning beyond peradventure. Yet of all ancient instrument names, this one proves to be the most Protean. In the earlier sources it designates a harp. Later it is applied to other types of stringed instrument, both to lyres and to lutes. But it does not remain confined to the chordophone category, for in the Imperial period it frequently signifies a panpipe. As no complete collection and analysis of the evidence has ever been made, I have thought it worth while to undertake one.

πηκτίς, genitive πηκτίδος, is the Attic-Ionic form, while in Lesbian and literary Doric we find πακτ-. The word is clearly formed from πηκτός/πακτός 'fastened, jointed', by means of the highly productive suffix -ίς. Because its relationship to πηκτός/πακτός must have been obvious to all, we cannot argue from the coexistence of the dialect forms that it came into use before the Attic-Ionic change of original  $\bar{a}$  to  $\eta$ ; if it began as πηκτίς among Ionians, speakers of Aeolic or Doric would naturally have restored πακτ- after πακτός, and vice versa. The lack of specific reference in the term 'the jointed' may have facilitated its transfer from one sort of musical instrument to another. It may be noted that by an independent development a type of bird-catching device—presumably the one that Aristophanes and Aristotle call πηκταί—came to be called πηκτίδες in the Roman period.<sup>3</sup>

## 1. πηκτίς AS A HARP

In the Archaic and Classical periods a number of texts indicate that the  $\pi\eta\kappa\tau$  is was a plucked chordophone with many strings, characterized by the playing of octave concords or the echoing of the melody at octave intervals. This points clearly to a harp. The instrument is strongly associated with Lydia. Here are the passages in question.

- (1) Anacreon, PMG 373:  $ν \hat{v}ν \delta'$  άβρ $\hat{\omega}$ ς ἐρόεσσαν ψάλλ $\omega$  πηκτίδα τηι φίληι κωμάζ $\omega$ ν †παιδὶ άβρηι†. The instrument here is plucked and makes a sweet or gentle sound.
- <sup>1</sup> My collection is based on data drawn from the Thesaurus Linguae Graecae CD-ROM (version D), plus two or three other passages that I happened to know.
- <sup>2</sup> On this suffix cf. C. D. Buck and W. Petersen, A Reverse Index of Greek Nouns and Adjectives, (Chicago, 1949), 416f.
  - <sup>3</sup> See N. V. Dunbar (Oxford, 1995) on *Birds* 527–8.
- <sup>4</sup> Fr. 99 Wehrli ap. Ath. 635bc; cf. my Ancient Greek Music (Oxford, 1992) [hereinafter 'AGM'], 58 n. 41, 73f.

- (3) Soph. Mysoi fr. 412 Radt πολὺς δὲ Φρὺξ τρίγωνος ἀντίσπαστά τε Λυδῆς ἐφυμνεῖ (or ἐφύμνει) πηκτίδος συγχορδία. Sophocles was evidently describing a banquet in ancient Mysia. The τρίγωνος (later τρίγωνον) is a type of harp. The πηκτίς is here again characterized as Lydian. Its συγχορδία may just refer to its concord with the τρίγωνος; but it may, especially as it is reinforced by ἀντίσπαστα (apparently neuter plural accusative in adverbial sense), allude to its typical use of octave-doubling. The latter word appears also in a fragment of Phrynichus' Phoinissai (TrGF 3 F 11), again presumably referring to music in an oriental setting: ψαλμοῖσιν ἀντίσπαστ' ἀείδοντες μέλη. There may have been a mention of  $\pi\etaκτίδε$  in the context, since Aristoxenus (loc. cit.) quoted the fragment together with the Pindar and Sophocles passages in support of his finding that την μάγαδιν καὶ την πηκτίδα χωρὶς πλήκτρον διὰ ψαλμοῦ παρέχεσθαι τὴν χρείαν.
- (4) Telestes, PMG 810.4: Pelops' followers introduced the Phrygian nomos of the Mountain Mother to Greece, τοὶ δ' ὀξυφώνοις πηκτίδων ψαλμοῖς κρέκον Λύδιον υμνον. Again a reference to plucking and the association with Lydia.
- (5) Diogenes, Semele, TrGF 45 F 1.6–9: I hear that Lydian and Bactrian girls living by the Halys worship the Tmolian goddess Artemis,  $\psi a \lambda \mu o \hat{i}s$  τριγώνων πηκτίδων  $<\tau'>$  (Casaubon) ἀντιζύγοις ὁλκοῖς (-αῖς Graf) κρεκούσας (Cas.: -σαις A, -ση CE)  $\mu \dot{\alpha} \gamma a \delta \iota \nu$ . The last two words mean 'thrumming an octave concord', 5 and ἀντιζύγοις perhaps means 'counter-strung', of the pairs of strings that answer each other at the octave, with ἀντι- as in ἀντίφθογγον and ἀντίσπαστα above.
- (6) Pl. Rep. 399c: πολυχορδία and παναρμόνιον will not be required in the songs of our designer city, so we shall not have jobs for makers of those instruments which are πολύχορδα and πολυαρμόνια, such as τρίγωνοι and πηκτίδες.

In other pre-Hellenistic passages where the  $\pi\eta\kappa\tau is$  is mentioned we cannot tell what sort of instrument is meant, but we may assume, in the absence of counter-indications, that it is always a harp. Hellenistic antiquarian writers, whose references are drawn from Archaic and Classical literature, may be included with this group of texts.

- (7) Margites 9.15 West<sup>2</sup> (P.Oxy. 3964): line-ending ] $\delta m \delta m \eta \kappa \tau i \delta \sigma s$ . The context is less than certain, but it may have been Margites' wedding, and the  $\pi \eta \kappa \tau i s$  may have been accompanying a dance. Cf. below, § 5 no. 74 (Dionysius of Halicarnassus).
- (8–10) Alcaeus 36.5  $\pi$ ]άκτιδι in a fragmentary context; Sappho 22.11  $\pi \hat{a}$ ]κτιν in broken context, apparently as the instrument on which a girl or woman would accompany the song that Sappho invites her to sing (supplementing 9 κέλομαί σ'ἀ[είδην, cf. 21.11f.); Sappho 156 πόλυ πάκτιδος ἀδυμελεστέρα. Either a harp or a lyre would be suitable in these passages, but the harp may have the stronger claim to  $\dot{\eta}$ δυμέλεια, and it may be added that the Lesbian poets mention lyres under other names:  $\dot{\lambda}$ ύρα Sa. 103.9; κίθαρις Alc. 41.15, cf. 38b.2; φοίνιξ Alc. p. 509 V. = fr. 424A Campbell.
- (11) Anacreon, PMG 386:  $\Sigma i\mu \alpha \lambda o\nu \epsilon i\delta o\nu \epsilon \nu \chi o\rho \omega i \pi \eta \kappa \tau i\delta' \epsilon \chi o\nu \tau \alpha \kappa \alpha \lambda \dot{\eta}\nu$ . Doubtless the same instrument as in the other Anacreon fragment (above, no. 1).
- (12) Hdt. 1.17.1: Alyattes marched against Miletus ὑπὸ συρίγγων τε καὶ πηκτίδων καὶ αὐλοῦ γυναικηίου τε καὶ ἀνδρηίου. Cf. Ἡροδότου λέξεις p. 222 Rosén, πηκτίς ὅργανον, ψαλτήριον. Once again the πηκτίς appears as a Lydian instrument.
- (13) Soph. Thamyras fr. 241: οἴχωκε γὰρ κροτητὰ πηκτίδων λύραι μοναύλοις †—†.

<sup>&</sup>lt;sup>5</sup> On the meaning of μάγαδις, cf. A. Barker in B. Gentili and R. Pretagostini (edd.), La musica in Grecia (Rome and Bari, 1988), 96–107; AGM 73.

- (14) Ar. Thesm. 1217: the Scythian asks where the old woman (the disguised Euripides) has gone; the chorus-leader asks, you mean the one  $\mathring{\eta}$  "φερεν τὰς  $\pi\eta\kappa\tau i\delta as$ ; The scholiast took this to be a kithara ( $\pi\eta\kappa\tau is$  ὄργανον κιθαρωιδικόν; cf. Suda below, § 3, no. 43), but if Aristophanes had intended a lyre, he had several words for 'lyre' at his disposal. Cf. Hermippus fr. 94 Wehrli (Vit. Eur. p. 5.16 Schwartz) for Euripides' alleged ownership of a harp ( $\psi\alpha\lambda\tau\eta\rho\iota$ ρον).
- (15) Anaxilas, Λυροποιός fr. 15.1 K.-A.: ἐγὰ δὲ βαρβίτους, τριχόρδους, πηκτίδας, κιθάρας, λύρας, σκινδαψὸν ἐξηρτυόμαν. The 'lyre-maker' made other kinds of stringed instrument besides lyres, as his inclusion of  $\tau \rho i \chi o \rho \delta o \iota$  (lutes) confirms.
- (16) Arist. Pol. 1341a40: many instruments of the ancients have gone out of fashion at Athens, such as  $\pi\eta\kappa\tau$ ίδες καὶ βάρβιτοι κτλ.
- (17) Aristox. fr. 97 W. (Ath. 182f, from which Eust. *Il.* 1157.52 and *Od.* 1558.8) lists the  $\pi\eta\kappa\tau$ is among foreign ( $\tilde{\epsilon}\kappa\phi\upsilon\lambda\alpha$ ) instruments. Wehrli's fr. 98, a statement that Aristoxenus identified the  $\pi\eta\kappa\tau$ is with the  $\mu\acute{a}\gamma\alpha\delta\iota$ s, is a mere alias of fr. 99 (above, under nos. 2–3), as is clear from the association of both with the same citation of Menaichmos (next).
- (18) Menaichmos of Sicyon,  $\pi \epsilon \rho i T \epsilon \chi \nu \iota \tau \hat{\omega} \nu$ , FGrH 131 F 4 (Ath. 635b, e), repeated Aristoxenus' equation of the  $\pi \eta \kappa \tau i s$  with the  $\mu \acute{a} \gamma a \delta \iota s$ , and stated that it was invented by Sappho.
- (19) Phillis of Delos ἐν δευτέρωι περὶ Μουσικῆς, FHG iv 476 fr. 2 (ap. Ath. 636b), included  $\pi\eta\kappa\tau$ ίδες and  $\mu\alpha\gamma$ άδιδες in a list of out-of-the-way instruments which reproduces the list of ἔκφυλα ὄργανα in Aristox. fr. 97. Athenaeus infers that Phillis denied the identity of  $\pi\eta\kappa\tau$ ίς and  $\mu$ άγαδις.

Nowhere before the time of Alexander do we find evidence for  $\pi\eta\kappa\tau$ is denoting anything but a harp. We may fairly conclude that this was the original application of the word. As to what type of harp it denoted, I have argued that, as it is distinguished from the  $\tau\rho$ iγωνοs, which is presumably the aggressively triangular 'spindle harp', it should refer to the other design seen on Attic vases, the one with a soundbox curving away from the player and over at the top, whether with or without a front pillar (AGM 71f.).

The name  $\pi\eta\kappa\tau$ 's may throw a little light into the dark prehistory of the Greek harp. Harps were widely used in the Near East from the fourth millennium on, and the dearth of evidence from Greece between the Cycladic culture of the mid third millennium and the late seventh century is surprising (AGM 70f.). Now, to designate a type of harp as 'the jointed' suggests an antithesis to a different type that is not jointed but made from a single piece of wood. Hesiod makes a similar distinction between two ploughs, the αὐτόγυον and the πηκτόν (Op. 433). In relation to harps, the distinction is naturally taken to be between the primitive arched harp derived from the musical bow, with a soundbox prolonged into a curving neck, and the angular harp, in which the neck was jointed to the soundbox at an acute angle. The latter displaced the former in Mesopotamia about 2000 B.C., and reached Egypt in the New Kingdom. The main types of Greek harp, including those which I have identified as  $\pi\eta\kappa\tau$ is and  $\tau\rho$ iy $\omega\nu$ os, belong to the angular, jointed category. A survival of the arched harp, however, is seen in the déclassé  $\sigma \alpha \mu \beta \dot{\nu} \kappa \eta$ , which was not necessarily made in one piece but nonetheless preserved the general shape of the primitive instrument (AGM 75-7). There is no evidence for the  $\sigma \alpha \mu \beta \dot{\nu} \kappa \eta$  before Eupolis, and it may have been a recent import. But the name  $\pi\eta\kappa\tau$  is suggests that some sort of arched harp had been known at an earlier period.

### 2. πηκτίς AS A LYRE

We have it on Aristotle's authority (above, no. 16) that the  $\pi\eta\kappa\tau$ is had fallen out of fashion ( $d\pi\epsilon\delta o\kappa\iota\mu\dot{\alpha}\sigma\theta\eta$ ). Aristoxenus and later antiquarian writers had to make inferences as to its nature from classical allusions.  $\psi\alpha\lambda\tau\eta\rho\iota\sigma\nu$  had by now become the normal word for a harp. From early Hellenistic times  $\pi\eta\kappa\tau$ is came to be used in literature of other stringed instruments, both lyres and lutes, though most of the evidence for the latter sense comes from later sources. This development probably came about not because there was anything distinctively 'jointed' about the instruments, but because the name was already established as that of a stringed instrument, no longer clearly identifiable, and so available for literary use as an elegant alternative to plainer names for more familiar objects.

Among lyres there was a conspicuous difference between the  $\kappa\iota\theta\acute{a}\rho a$ , the box lyre used by the professional citharode, and the  $\lambda\acute{\nu}\rho a$ , the homely instrument made from a tortoise shell. With the decline of private music-making, it was the former type that was the more familiar to the public. When  $\pi\eta\kappa\tau\acute{\iota}s$  is used of a lyre, it seems generally to be the other type, except in a couple of late passages. Here are the passages for which I propose this interpretation.

- (20) Hymn. Curet. 7 καὶ γέγαθι μολπᾶι, τάν τοι κρέκομεν πακτίσι μείξαντες ἄμ' αὐλοῖσιν. There is no proof that these are not still harps, but I can recall no evidence for harps in cult use, or in combination with auloi, whereas lyres can certainly be documented in both connections. As the singers all(?) seem to be equipped with them, something humbler than the kithara is likely.
- (21) Theoc. epigr. 5. 2 Gow (Gow-Page, HE 3493): sing me something on the twin auloi, I will take up the  $\pi\eta\kappa\tau$ is and  $d\rho\xi\epsilon\hat{v}\mu ai$   $\tau\iota$   $\kappa\rho\epsilon\kappa\epsilon\iota\nu$ , while Daphnis the cowherd will play  $\kappa\eta\rho\sigma\delta\epsilon\tau\omega\iota$   $\pi\nu\epsilon\dot{v}\mu\alpha\tau\iota$ . The simple lyre seems the likeliest companion for the auloi and panpipe in this context.
- (22–25) Nicarchus, A.P. 6.285.7 (HE 2743): a young woman has abandoned weaving for the life of a hetaira, taking up στεφάνους καὶ πηκτίδα; Meleager A.P. 5. 139.1 (HE 4146), to a bewitching woman: ἀδὺ μέλος, ναὶ Πᾶνα τὸν Ἀρκάδα, πηκτίδι μέλπεις, Ζηνοφίλα, ναὶ Πᾶν', ἀδὺ κρέκεις τι μέλος; 140. 1 (4152) fere item; 175.8 (4361), a promiscuous woman is dismissed, καλεῖ σε γὰρ ἡ φιλόκωμος πηκτὶς καὶ κροτάλων χειροτυπὴς πάταγος. In all these four passages the πηκτίς appears as the typical instrument of the singing hetaira and the symposium. A harp—especially a σαμβύκη—cannot be ruled out, but a lyre is at least as likely. In the next passage it is certain:
- (26) Marcus Argentarius, A.P. 9.270.4 (Gow-Page, GP 1444): the comast sees his dance as a parallel to that of the stars, his garland and his  $\kappa \epsilon \lambda a \delta \epsilon \iota \nu \dot{\eta} \pi \eta \kappa \tau i s$  corresponding to the constellations  $\Sigma \tau \dot{\epsilon} \phi a \nu o s$  and  $\Lambda \dot{\nu} \rho a$ .
- (27) GVI 1925 (i A.D.?): epitaph on a beautiful, virtuous woman, to whom the Muse gave καὶ σοφίαν καὶ πακτίδα τὰν φιλέραστον.
- (28) Plut. Quaest. conv. 7.7.1 p. 710b, alluding to Plato's Symposium at which the auletris was dismissed so that the guests could entertain themselves with intellectual debate (176e): Φίλιππος ὁ Προυσιεὺς ἐᾶν ἐκέλυσεν τοὺς παρ' Ἀγάθωνι δαιτυμόνας
- $^6$  I would assume the same for the Laconian Hyakinthia as described by Polycrates, FGrH 588 F 1, where the boys' chorus  $\kappa\iota\theta$ αρίζουσιν ἐν χιτῶσιν ἀνεζωσμένοι, καὶ πρὸς αὐλὸν ἄιδοντες πάσας ἄμα τῶι πλήκτρωι τὰς χορδὰς ἐπιτρέχοντες ἐν ῥυθμῶι μὲν ἀναπαίστωι, μετ' ὀξέος δὲ τόνου τὸν θεὸν ἄιδουσιν. (κιθαρίζω is the ordinary word for playing any sort of lyre and does not imply kitharas.)

 $\epsilon$ κείνους, παντὸς αὐλοῦ καὶ πηκτίδων  $\epsilon$ πιτερπέστερα  $\phi$ θεγγομένους. The πηκτίδες are not in Plato but have been added by Plutarch as the typical instrument (besides the aulos) of the symposium.

- (29) Luc. Dial. mar. (78) 1.4: Polyphemus' lyre, made from a deer's skull, with its horns for arms, is called both  $\pi\eta\kappa\tau$ is and  $\lambda$ i $\rho\alpha$ .
- (30) Philostr. *Imag.* 1.10.3: a painting of Amphion receiving the lyre as a gift from Hermes. The instrument is described in detail, and it is made from a tortoise and goat's horns, so properly a  $\lambda \dot{\nu} \rho a$ , not a  $\kappa \iota \theta \dot{a} \rho a$ . Philostratus calls it a  $\lambda \dot{\nu} \rho a$  eight times, and a  $\pi \eta \kappa \tau \dot{\iota} s$  once by way of *variatio*.
- (31) Id. ib. 2.2.4: a painting representing the education of Achilles.  $\pi\eta\kappa\tau is$  is used of Chiron's lyre, the civilizing instrument  $\dot{\nu}\phi'$   $\dot{\eta}s$   $\dot{\epsilon}\kappa\mu\epsilon\mu o\dot{\nu}\sigma\omega\tau a\iota$ .
  - (32) Orph. Arg. 413: Chiron's lyre again.

In the last two passages of this section  $\pi\eta\kappa\tau$  is seems to be used more loosely of a lyre that we should expect to be a kithara:

- (33) Kaibel, *Epigr.* 1025.9 (hymn to Apollo, Tenos, ii or iii A.D.):  $\pi\eta$ ]κτίδα δ' οὐρανίων ἐτάρην θαλίης τ[ε χορῶν τε. The preceding and following verses are missing, but there is presumably an allusion to Apollo's kithara.
- (34) Orph. Arg. 6: Orpheus' lyre (called  $\kappa\iota\theta\acute{a}\rho\eta$  at 707,  $\chi\acute{\epsilon}\lambda\upsilon$ s at 72 and 88,  $\phi\acute{o}\rho\mu\iota\gamma\xi$  at 111, 419, 1001, 1274).

### 3. πηκτίς AS A LUTE

The lute appeared in Greece in the mid fourth century B.C.<sup>7</sup> Its usual name is  $\pi a \nu \delta o \hat{v} \rho a$  (or some variant of this), but the  $\tau \rho i \chi o \rho \delta o \iota$  of Anaxilas (above, no. 15) must also be lutes. The passages in which  $\pi \eta \kappa \tau i s$  is applied to this instrument are mostly post-Hellenistic, but the first is relatively early, from the time of Alexander.

- (35) Sopater of Paphos, fr. 11.1 Kaibel (CGF 194):  $\pi\eta\kappa\tau$ is δὲ μούσηι γαυριῶσα βαρβάρωι δίχορδος εἰς σὴν χεῖρα πῶς κατεστάθη; The reference must be to a two-stringed lute.
- (36) Aretaeus 5 (= Cur. Acut. 1). 1.15 (CMG ii.94.32): people are lulled to sleep by familiar surroundings, μουσικῶι δὲ (sc. ὕπνου ἀγωγὰ) ἐρεθισμὸς (ἔτι ἐθισμὸς codd.: correxi) αὐλῶν ἐφ' ἡσυχίηι ἢ ψαλμὸς λύρης ἢ πηκτίδος ἢ μελέτη παίδων ξὺν ἀιδῆι. The πηκτίς here is a plucked instrument distinct from a λύρα. Perhaps a harp is meant, but ψαλτήριον would be the normal word for a harp at this date. The lute therefore comes into question; though it might be objected that  $\pi a \nu \delta o \hat{v} \rho a$  would be the expected word for that.
- (37) Plut. De virt. mor. 443a: instruments that mirror human emotions,  $\psi a \lambda \tau \dot{\eta} \rho \iota a \ldots \kappa a \dot{\iota} \lambda \dot{\nu} \rho a s \kappa a \dot{\iota} \pi \eta \kappa \tau \dot{\iota} \delta a s \kappa a \dot{\iota} a \dot{\iota} \lambda \delta \dot{\nu} s \kappa \tau \lambda$ . Harps are covered by  $\psi a \lambda \tau \dot{\eta} \rho \iota a$ , lyres by  $\lambda \dot{\nu} \rho a s$ .
- (38-40) Hesychius  $\pi$  2169  $\pi\eta\kappa\tau$ ίδες καὶ σύριγγες ὄργανα μουσικά. 2170  $\pi\eta\kappa\tau$ ίδος  $\pi$ ανδουρίου. 2171  $\pi\eta\kappa\tau$ ίς  $\pi$ ανδούριον, ψαλτήριον, σῦριγξ, ὄργανον. Here we find  $\pi\eta\kappa\tau$ ίς explicitly identified with the lute, besides other explanations as harp or panpipe.
- (41) Phot. Lex. πηκτίς πανδούριον, ήτοι Λύδιον ὄργανον χωρὶς πλήκτρου ψαλλόμενον. The second explanation reflects Aristoxenus (fr. 99, cf. above under no. 3; fr. 97, above under no. 17).

<sup>&</sup>lt;sup>7</sup> See R. A. Higgins and R. P. Winnington-Ingram, *JHS* 85 (1965), 62–71; *AGM* 79f.

(42–3) Suda [π 181 πανδούρα· μάχαιρα κρεωκόπος. ἡ πηκτίς. ζήτει ἐν τῶι πηκτίς.] π 1502 πηκτίς πηκτίδος· πανδούρα· μάχαιρι κρεωκόπος. παρὰ δὲ Αριστοφάνει ἐν Θεσμοφοριαζούσαις εἶδος ὀργάνου κιθαρωιδικοῦ· "τὴν γραῦν ἐρωτᾶις ἡ "φερεν τὰς πηκτίδας;" ἢ εἶδος ἀκολάστου σχήματος. The Aristophanes quotation is from sch. Ar. Thesm. 1217 (cf. above, no. 14).

## 4. πηκτίς ΑS Α PANPIPE

The application of the name  $\pi\eta\kappa\tau i_s$  to the panpipe appears only in the Imperial period, unless the Vienna bucolic fragment is of earlier composition, but is then abundantly attested. It is foreshadowed by Theocritus' use of the verb  $\pi\eta\gamma\nu\dot{\nu}\nu a\iota$ ,  $\pi\dot{\eta}\gamma\nu\nu\sigma\theta a\iota$  with reference to the making of a panpipe: Idyll. 4.28  $\chi\dot{a}$   $\sigma\hat{\nu}\rho\iota\gamma\xi$  ...  $\ddot{a}\nu$   $\pi\kappa\dot{a}$   $\dot{a}$   $\dot{a}$ 

- (44–5) Anon. Bucol. (*P. Vindob. Rainer* 29801; Gow, *Bucolici Graeci*, 168) 10f.: Silenus asks Pan,  $\pi \hat{\omega}_s$  δὲ  $\chi$ ]ορῶν ἐπ' ἀγῶνας ἄνευ σύριγγος ἱκά[νεις;  $\pi \hat{\eta}_l$  σ]οι  $\pi \eta \kappa \tau \hat{\iota}_s$  ἔβη,  $\mu \eta \lambda ο \sigma \kappa \acute{o} \pi \epsilon$ ;  $\pi \hat{\eta}_l$  σεο  $\phi$ [ωνή; Ibid. 54ff.: Pan collects wax and makes a new  $\pi \eta \kappa \tau \acute{\iota}_s$  (63  $\pi$ ] $\eta \kappa \tau \acute{\iota} \delta \alpha$   $\pi \hat{\eta} \xi \epsilon$   $\chi \rho \acute{\iota} \sigma \alpha s$ ). The description of his playing it in 71–7 leaves no doubt that it is the panpipe. In 10–11, therefore,  $\pi \eta \kappa \tau \acute{\iota}_s$  is a mere variatio on  $\sigma \hat{\nu} \rho \iota \gamma \xi$ , not distinguished from it.
- (46) Anacreontea 43. 4–11 (3rd–4th century?): a drinking party is described; a girl dances as a maenad ὑπὸ βαρβίτωι, while a lad στομάτων άδὺ πνεόντων κατὰ πηκτίδων ἀθύρει, προχέων λίγειαν ὀμφάν.
- (47) Aristid. Quint. 2.5 (p. 58.13 W.-I.): the pleasure of music is a powerful lure even for animals,  $\dot{\omega}_S$  δηλοῦσι ποιμένων τε σύριγγες καὶ αἰπόλων πηκτίδες. The distinction between shepherds and goatherds and between σύριγγες and πηκτίδες seems to be drawn on purely literary grounds.
- (48) Heliodorus Aeth. 4.17.1: (Tyrian merchants)  $\pi\rho\delta s$  αὐλο $\hat{i}s$  ἔτι καὶ ὀρχήσεσιν ὄντας, ἃς ὑπὸ  $\pi\eta\kappa\tau i\delta\omega\nu$  ἐπίτροχον μέλος Ἀσσύριόν τινα νόμον ἐσκίρτων. The nature of the instrument does not appear clearly here, except that it is one used by amateurs at improvised entertainments.
- (49) John Chrysostom, De sacerdotio 6.12 line 136: μειράκιον τῶν ἐν ἀγρῶι τραφέντων καὶ τῆς πηκτίδος καὶ τῆς καλαύροπος πλέον εἰδότων οὖδέν. We find the same conjunction of <math>πηκτίς and καλαῦροψ in three passages of Nonnus (Dion. 15.348f., 43.216f., 47.400f.).
- (50) Id. In epist. ad Coloss. 1.1.5 (PG lxii 306.50ff.) condemns pagan revelry: ἐκεῖ μὲν αὐλοὶ καὶ κιθάραι καὶ σύριγγες, ἐνταῦθα δὲ οὐδὲν ἀπηχὲς μέλος, ἀλλὰ τί; ὅμνοι, ψαλμωιδίαι. He proceeds to contrast our (Christian) praises of God with their celebration of δαίμονες: τὰ γὰρ διὰ τῶν πηκτίδων οὐδὲν ἄλλο ἢ δαιμόνων ἄισματα. Of the three instruments first mentioned, it must (in view of the other Chrysostom passage) be the σύριγγες that are picked up by τῶν πηκτίδων.
- (51) Kaibel, Epigr. 271 (Aegina, 4th–5th century? A statue of Pan speaks) οὖκέτι κηροχύτοισι κατ' οὔρεα τέρπομε (-αι) αὖλοῖς πηκτίδος, οὔτ' ἄντροις, οὖ δένδρεσιν.
- (52–70) The word occurs 19 times in Nonnus' *Dionysiaca*, apparently always of the panpipe; see Vian's note on 26.206 in the Budé edition (vol. ix.279). Of Cadmus' panpipe, 1.389, 431, 434, 444; 2.19. Of panpipes coupled with auloi as wedding music, 8.377, cf. 26.206. As the instrument of Pan or Panes, 11.124, 20.338, 43.217, 45.186. As a herdsman's instrument, 15.348 (= 303  $\sigma \acute{\nu} \rho \iota \gamma \gamma \iota$ ), 47.400. As Dionysus' instrument,

- 27.171, cf. 28.43. As Polyphemus' instrument, 40.557. The other passages are all compatible: 7.52, 12.122, 20.93.
  - (71) Arabius Scholasticus, A.P. 16.225. 4: Pan's syrinx.
  - (72) Agathias, A. P. 16.244.6: a satyr's reed pipe (δόναξ, κάλαμος).
  - (73) Cometas Chartularius, A.P. 9.586.5: Pan's syrinx.

### 5. PASSAGES OF UNCERTAIN REFERENCE

Although the meaning is not strictly determinable in all of the above texts, relationships with other passages allow us to assign them to one or other heading with some degree of probability. There remain a few passages where it is more difficult to establish precisely what instrument the author had in mind.

- (74) Dion. Hal. Ars rhet. 4.1 (ii.270.13 Us.-Rad.) mentions auloi and  $\pi\eta\kappa\tau i\delta\epsilon_s$  as the typical accompaniment of a wedding song. We have seen one possible reference to the harp being used in this connection (Margites, above, no. 7); but Dionysius is not likely to be using  $\pi\eta\kappa\tau is$  in this sense unless he is echoing allusions of Archaic or Classical date. At his period the lute may come into question: I do not know of any reference to it being played at weddings, but it is perfectly conceivable. In art lutes are normally played by women or by an Eros. Panpipes too are a possibility, and here we can adduce Nonnus (cited above under nos. 52-70).
- (75) Plutarch, De tribus reip. generibus 827a, recalls Plato's recommendation to dispense with instruments more complex than the  $\lambda \acute{\nu} \rho a$  and  $\kappa \iota \theta \acute{a} \rho a$  (Rep. 399cd, above, no. 6), but he elaborates the list of rejected instruments to include  $\pi \eta \kappa \tau i \delta a s$ ,  $\sigma a \mu \beta \acute{\nu} \kappa a s$ ,  $\kappa a \grave{\iota} \psi a \lambda \tau \acute{\eta} \rho \iota a \pi o \lambda \acute{\nu} \phi \theta o \gamma \gamma a \kappa a \grave{\iota} \beta a \rho \beta \acute{\iota} \tau o \nu s \kappa a \grave{\iota} \tau \rho \acute{\iota} \gamma \omega \nu a$ . He seems to have thrown in several instrument-names taken from literary or antiquarian sources—some of them no longer current—and may have had no clear idea of what they were. His  $\pi \eta \kappa \tau \acute{\iota} \delta \epsilon s$  come from the Plato passage, but if he attached a definite meaning to the word, it may have differed from Plato's. Lutes and panpipes are likeliest; it may speak against the latter that Plato does actually allow them for rustics.
- (76) Herodian, Kaθολικὴ προσωιδία i.104.4 Lentz, notes that the word is oxytone. The meaning is irrelevant here.
- (77) Clement, Paed. 2.42.2–3 (i.183.6 St.), lists a series of instruments used in pagan festivity but discredited by military applications: χρώνται γοῦν παρὰ τοὺς πολέμους αὐτῶν Τυρρηνοὶ μὲν τῆι σάλπιγγι, σύριγγι δὲ Αρκάδες, Σικελοὶ δὲ πηκτίσιν, καὶ Κρητες λύραι, καὶ Λακεδαιμόνιοι αὐλῶι, καὶ κέρατι Θρᾶικες, καὶ Αἰγύπτιοι τυμπάνωι, καὶ Άραβες κυμβάλωι. ένὶ δὲ ἄρα ὀργάνωι τῶι λόγωι μόνωι τῶι είρηνικωι ήμεις κεχρήμεθα, ωι γεραίρομεν τον θεόν, οὐκέτι τωι ψαλτηρίωι τωι παλαιῶι καὶ τῆι σάλπιγγι καὶ τυμπάνωι καὶ αὐλῶι. What are these πηκτίδες that the Sicilians use? If  $\psi \alpha \lambda \tau \eta \rho i \omega \iota$  in the following sentence picks up one of the items in the list, it must be this one. But harps would not seem effective either for giving signals or for disconcerting the enemy. Neither would a lyre, a lute, or a panpipe, even if Nonnus (27.170f., 28.42f.) fancifully makes Dionysus use his panpipe in battle in place of a trumpet (just as other Bacchic accoutrements double as military equipment, the Maenads' thyrsi becoming lethal spears, and so on). Otherwise I can only recall Herodotus' reference to the Lydians marching to war ὑπὸ συρίγγων τε καὶ πηκτίδων καὶ αὐλοῦ γυναικηίου  $\tau \epsilon$  καὶ ἀνδρηίου (above, no. 12), and the earlier mention in the Doloneia of the Trojans and their allies diverting themselves round the camp-fires with auloi and σύριγγες (Il. 10.13).
  - (78) Isid. Orig. 3.22.3 paulatim autem plures eius [= citharae] species extiterunt, ut

psalteria lyrae barbitae phoenices et pectides, et quae dicuntur Indicae et feriuntur a duobus simul. The terminology is confused, for psalteria should not be included among varieties of cithara, even if we take this as meaning 'lyre' in general. Isidore clearly understands pectis to be a stringed instrument, but he has probably taken it from some older source without having any clear conception of its nature.

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Reconstructing the Medieval Arabic Lute: A Reconsideration of Farmer's 'Structure of the

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### **CURTIS BOUTERSE**

# Reconstructing the Medieval Arabic Lute: a Reconsideration of Farmer's 'Structure of the Arabic and Persian Lute'

Anyone who attempts to recreate the music of medieval Europe must labour under a multimate of the music of medieval Europe must labour under a multitude of burdens, conceptual and concrete; theoretical as well as physical limitations; perceptions of the past and present. The greatest problem facing those interested in early instruments and performance is the fact that practically no instruments are extant from before 1450. Almost all our information is derived from iconography and though this is a rich and rewarding source, it is rather limited (not to say one-dimensional) and we could wish for more hard data. Fortunately we may find some with the help of Orientalists, since virtually all medieval European musical instruments were introduced from the East, either through Byzantium or the Islamic world. Though many forms evolved considerably after their arrival, some remained essentially the same for centuries, most notably the lute. Dr Henry George Farmer, the great and prolific scholar of medieval Islamic music, has left us several sets of measurements from theoretical treatises on the lute which can provide useful data once certain key problems are resolved.1

The shape of the medieval European lute as we know it, with its rather round body, distinct neck, and usually a central sound hole or rose, was a rather late occurence. Curt Sachs believed it was developed in Moorish Spain and spread back to the Middle East. This is probable, though there is a wide variation in the shape from earliest times which hint at it. The most common early lutes, as depicted from Central Asia through the Middle East and into Europe, were morphologically distinctive: a more almond shape than later, shoulder sloping to the neck, and often paired soundholes. This is the lute most often seen in Andalusia and Sicily (Fig. 1).<sup>2</sup> By the time of the illustrations in the Cantigas this seems to have been obsolete. Its earlier forms, including perhaps the Persian barbat, were made in one piece, with the neck an integral part of the body. As Sachs has pointed out,<sup>3</sup> frets would have

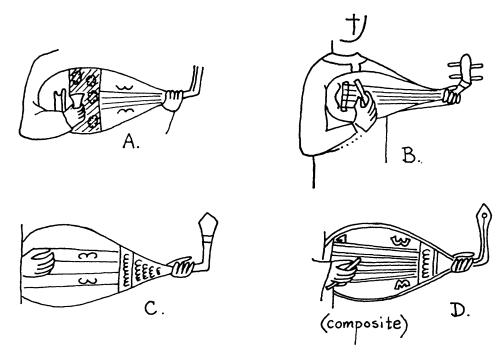


FIG. I

- A. Manichaean MS., 8-9th C., Turfan, Sinkiang. Plate 4, Mani and Manichaeism, Geo Widengren, New York, 1965.
- B. 'Portrait' of Albert de Gapeuses, trobador, c. 13th century. MS. No. 64, Byzantine and Medieval Music, R. Goldron, N.Y., 1968.
- C. Islamic style painting on ceiling, Cappella Palatina; Fig. 33.
- D. European-naïve style painting in aisle of Cappella Palatina, Palermo, 12th century. Fig. 34 (composite of two similar lutes), Music of the Spheres and the Dance of Death, Kathi Mayer-Baer, Princeton, 1970.

been difficult to tie on the sloping neck, but since Farmer has conclusively proved that the Arabs did use frets on their lutes in the Middle Ages,<sup>4</sup> the advantage of the separate neck must have become obvious. Most iconographic sources show the lute in course of being played, and since artistic conventions of the period place the left hand holding the neck roughly at the joint with the body, it is difficult to say whether the instruments had a separate neck or not. We do not know exactly when the lutes began being built up from ribs rather than being carved from a block or, indeed, whether this was considered a 'development' or whether they were simply alternative methods, but the Arab manuscripts from at least the 10th century onward mention ribs as standard construction.<sup>5</sup> Neither do we know the exact relationship between the traditional 'Eastern' shaped lute and the

rounder 'European' shape: whether it was a matter of acoustical development or merely stylistic. However, since the manuscripts described by Farmer, though delineating the 'Eastern' shape, refer to the neck as having a specific length, my assumption is that this was a separate entity. Although the construction seems to have changed substantially, from carved to carvel, the traditional shape was retained.<sup>6</sup>

The earliest specifications cited by Farmer are those of Al-Kindi (9th century) which are tantalisingly incomplete and, with one exception, given by proportions. The depth of the body was one half the breadth at the widest point, i.e. the ideal cross-section at the widest point is a semicircle, a common and recurring form for the back as we shall see. The 'beating place of the strings', which was protected by a strip of tortoise shell, was at the widest point of the body and the tenth part of the string-length, which was 67.5 cm. Unfortunately, this fragmentary jumble of dimensions and proportions does not overlap sufficiently to allow calculation either of complete proportions or of overall dimensions, but it will be surprisingly useful later. The Ikhwan al-Safa (10th century) left us a manuscript which is wholly proportional: the depth is once again half the width, the body's length is one-and-a-half times the width, and the neck is one quarter the overall length. At last we can see the dim outlines of a complete lute. 10

Four hundred years later we have two manuscripts with complete dimensions: one in Arabic, by Ibn al-Tahhan, and one in Persian, the Kanz al-tuhaf. The measurements in the Kanz al-tuhaf, according to Farmer, indicate an instrument approximately 17 cm. deep, 34 cm. wide (1: 2 proportions again), and 162 cm. long; i.e. almost 5 ft. 4 in. tall! This large figure could be dismissed as a typographical error but for Farmer's presentation of Ibn al-Tahhan's dimensions as 28½ in. wide and 5 ft. 11 in. long! These preposterous figures may account for the general lack of attention to his article. Dr Farmer, not taken aback by these measurements, went on to refer to these instruments 'of considerable dimensions' as 'arch-lutes' of the type portrayed in Persian miniatures. But even if we assumed they were played 'on the shoulders of giants', a lute 5 ft. 4 in. long and only 13 in. wide is far beyond the wildest vagaries of artistic license.<sup>11</sup>

The solution to this tangle lies, I believe, in the original measuring system. Though it is a risky business to tamper with historical information, critical analysis is always needed and, especially in medieval musicology with its paucity of data, even musical intuition may have to be brought to bear. I am neither Arabist nor musicologist of the

stature of Dr Farmer, but both the Arab and Persian MSS. of the 14th century seem to use an easily confused system of measurement. The Persian angusht (Arabic isba, plural asabi) was 2.25 cm. and the angusht mundam (Arabic isba madmum) was twice as long, 4.5 cm. It seems obvious that scribal error could account for distortion by a factor of two, in either direction. I should be very surprised to hear from scholars that this was not common in manuscripts of the period. In the case of the lute from the Kanz al-tuhaf, if we read 36 angusht instead of 36 angusht mundam, we find an instrument of feasible dimensions which matches our expectations from iconography as well. This new length, 81 cm., gives us another and remarkable confirmation. Subtracting the distance of the bridge from the bottom (13.5 cm. according to the manuscript) gives a string length of 67.5 cm., exactly the same as in Al-Kindi five centuries earlier. There remains one other problem: we know the width of the body, but not where the widest point occurs. The extreme possibilities range from an oval to a quite flattened teardrop. A very logical, consistent and conforming piece of information from 15th-century Europe provides a possible solution. Arnault of Zwolle tells us that the bottom of the body should be a semicircle, as is the cross-section of the back (cf. above). This assumption provides the link between proportion and measurement which enables us exactly to fix all the data.

Keeping these two modifications in mind—selective reduction or augmentation by a factor of two, and the semicircular bottom—we arrive at shapes and specifications for two lutes of similar sizes. The smaller of the two, from the Kanz al-tuhaf, is 81 cm. long; the neck one quarter of the overall length (20.25 cm.); the body width (at its widest point, 16.875 cm. from the bottom) is 33.75 cm.; the bridge is 13.5 cm. from the bottom; string length 67.5 cm.; and the depth is 16.875 cm. Fig. 2 shows (left) the instrument as measured in the manuscript and (right) as corrected above.

The larger of the two lutes (Ibn al-Tahhan's MS.) presents a more difficult problem. The measurements seem particularly corrupt and to obtain an instrument matching reality it is necessary to reduce both length and width by half. The length is then 90 cm. overall and 36 cm. wide. The neck is given in absolute, not proportional, measurements, which make it longer than the usual one fourth, but certainly not impossible; it is to be the same length as the pegbox (the only information we have on that part, though it seems rather long in this instance) or 29.25 cm. Two additional anomalies remain. The bridge seems to need increasing from 2 asabi from the bottom to 2 asabi madmum, or 9 cm. This makes a string length of 81 cm. and puts the widest part of

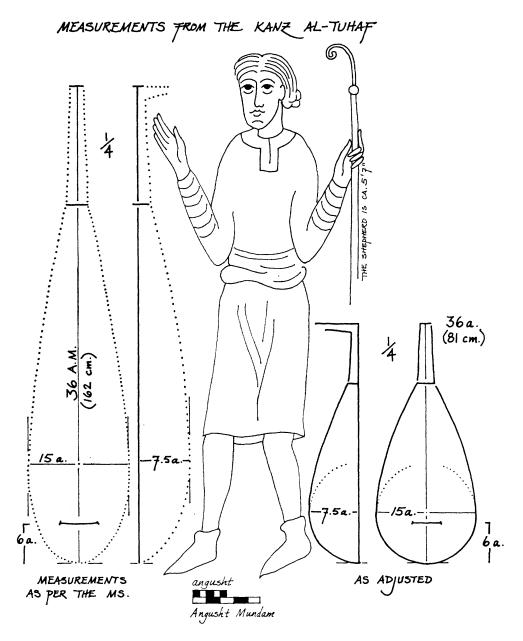


FIG. 2

the body at roughly the tenth part of the string length, as in Al-Kindi. The remaining measurement is the depth of the back; the manuscript gives us 27 cm., which may be correct but seems rather deep compared with other sources. Iconography is seldom helpful with the backs of instruments, alas! Half that figure is too thin, and the proportion of Al-Kindi and the Ikhwan al-Safa, namely half the width (18 cm.), lies between the two extremes. We are left with a dilemma or else a very deep soundbox. The results, including the three depths, are shown in Fig. 3.

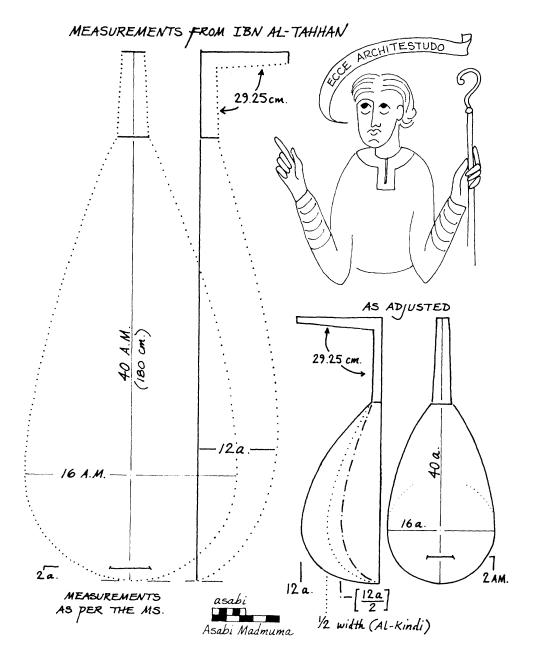


FIG. 3

An interesting point is that when the plans of the two lutes are compared, except for the longer neck of the Arab instrument, the bodies are of almost identical size. Both are 60.75 cm. long and their widths are 36 cm. versus 33.75 cm. Those are very tight parameters for coincidence. The depth, as mentioned, and the bridge placement do differ substantially, but closer study of the original manuscripts, or additional sources may serve to narrow the gaps.

In our search for data on medieval instruments we cannot afford to ignore anything, even though, as in this case, it seems to be outside the mainstream of our inquiry. This particular form of lute may have been extinct early enough not to have had any direct influence on the dominant European type, but it was the instrument and its construction techniques which introduced the idea of 'lute' to Europe and, at least in Spain, it enjoyed unsurpassed popularity for half a dozen centuries. If we aspire, as I do, to recreate medieval Spanish music in all its dazzling diversity of influences and instruments, then it is incumbent on us to build and restore this lute to its rightful place of honour.

#### **NOTES**

- I His article, 'The Structure of the Arabian and Persian Lute in the Middle Ages', appeared in the Journal of the Royal Asiatic Society in 1939 and was reprinted in his Studies in Oriental Musical Instruments, II. It is almost incomprehensible that in all these years no one has noticed the discrepancies in his measurements; and over thirty-five years later an article in Asian Music credits Dr Farmer with having described a medieval Arabic lute 'three feet wide', without raising an eyebrow, rhetorical or otherwise. Musicologists are indeed a rare tribe when none balk at trying to reach round a three-foot-wide lute!
- 2 The most famous examples occur on the many Moorish ivory caskets, particularly the Leire Casket in Pamplona Cathedral and the 'Bote de Almoguira' (al-Mughiza, d. 968) and the 'Bote de Davillier' (10th century), both in the Louvre.
  - 3 History of Musical Instruments, New York, 1940, p. 254.
  - 4 'Was the Arabian and Persian Lute Fretted?', JRAS, 1937.
- 5 If this carvel construction was being used prior to the introduction of the lute into Europe, it hardly seems likely, as David Munrow held, that Europeans were hollowing their lutes out of blocks until the Renaissance. (See his *Instruments of the Middle Ages and Renaissance*, 1976, p. 25.)
- 6 Exactly how the neck joins the sloping shoulders of this particular-shaped body is still problematical, but a thorough survey of the iconography should shed some light. There seems to be, for example, a depiction of a lute in profile in *Ars Islamica*, IX, p. 115. (See also Fig. 1.)
- 7 We should be ever aware of the influence of 'ideal proportion' of cosmological importance or even 'purely' geometrical structures from Greek and other Eastern sources in our analysis of Arabic and European documents. We do not know whether *actual* lute construction would have followed any such theoretical models; the example of architecture, however, suggests that it would.
- 8 Beating-place may sound a trifle harsh, but recall that the medieval lute was played with a plectrum and, if modern *ud* practice is any guide, rather percussively at that.
- 9 Actually, after telling us the 'beating place of the strings' was 6.75 cm. from the bridge and a tenth the length of the strings, Farmer concludes that

the string length was 75.25 cm! Bessaraboff, in his excellent Ancient European Musical Instruments, assumes there were eleven parts to the string length and corrects Farmer's 'slip of the pen' to read 74.25 cm. He also garbles the proportions of the Ikhwan al-Safa lute.

To It is possible the correlation with Al-Kindi's measurements is even more direct than first reading would indicate. The passage begins: 'It has been said, "Seek help in every art from its own people". So we say that the people of this art [of music] have said that we ought to make the instrument which is called the lute of wood, its length and its width and its depth being in the most excellent proportions'. Considering the importance of Authority in a traditional society, they might easily have been referring to Al-Kindi.

11 Late medieval Persian, and Mughal, illuminations of lutes do seem to portray 'archlutes' larger than those shown elsewhere, but the proportions depicted are unique and differ primarily in being much wider than usual.



Lute-Players in Greek Art

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# LUTE-PLAYERS IN GREEK ART

(PLATES XVI, XVII)

The primary purpose of this article is to publish two terracotta representations of luteplayers in the British Museum. The subject is rare, but not quite so rare as might be supposed from the scarcity of literature about it.<sup>1</sup> It has, therefore, seemed worth while to add a list of the examples known to us—a list which does not claim to be exhaustive—and to discuss briefly some of the problems which they raise. We do this in the hope that it may stimulate further investigation of a neglected theme.

Between lutes and lyres² there is a difference of principle which could hardly be more fundamental. The strings of the lyre are relatively numerous, but, in default of a finger-board, fret-board, or neck, against which they could be firmly pressed (or 'stopped'), the possibilities of obtaining more than one note from each string, in so far as they existed, must have been limited as to the number and quality of notes obtainable.³ The lute has few strings, but they are stretched over a solid neck, or a prolongation of the sound-box, against which they can be pressed so as to shorten the string-length and produce notes of higher pitch than those of the open strings; each string can thus provide a number of notes of approximately equal quality. Lutes and lyres were both common in Asia and in Egypt.⁴ In Greek lands the lyre predominated, and no examples of the lute are found in art before the fourth century B.C.⁵ The examples known to us are mostly terracottas.

(i) Only one of these terracottas can be dated securely to the fourth century and no later. This is not a free-standing statuette, but a gilt terracotta appliqué of a kind made in Tarentum for the decoration of coffins.<sup>6</sup> It is part of a set recently acquired by the Museum für Antike Kleinkunst in Munich. Other examples from tombs at Tarentum date these objects to the last thirty years of the fourth century B.C.

Next comes a group of statuettes in the early Hellenistic, so-called 'Tanagra', style of about 330 to 200 B.C. Three of the players are women.

- (ii) PLATE XVI 1, 2 show a girl playing a lute. The provenience of this piece, now in the British Museum, is not known, but technical considerations would suggest that it was made in Cyprus.<sup>7</sup> The strong frontality of the pose, the hair-style, and the manufacture
- R. A. H. was responsible for archaeological details in the article, the literary and musical discussions were the work of R. P. W.-I.
- <sup>1</sup> Notably, Th. Reinach, 'La guitare dans l'art grec', REG viii (1895) 371-377, figs. 1-4 (to which his article in Daremberg and Saglio, s.v. 'Lyra', adds nothing). H. G. Farmer, 'An early Greek pandore', J. R. Asiatic Society 1949, 177-179, pl. 13, is mainly concerned with a Byzantine example: he mentions, but does not describe or illustrate, the two pieces from the British Museum—(ii) and (v) below. articles in RE., s.v. 'Saiteninstrumente' (i A 1765 f.-Abert, 1920), s.v. 'Pandura' (xviii. 3. 559—Wegner, 1949). The Greek evidence is discussed in some general works. E. Biernath, Die Guitarre seit dem III Jahrtausend vor Christus, Berlin, 1907 (unillustrated and unimpressive). K. Schlesinger, The precursors of the violin family, London, 1910. F. Behn, 'Die Laute im Altertum und früher Mittelalter', Zeitschrift f. Musikwissenschaft i (1918) 89-107: a useful article, consisting of 27 illustrations with full comment (the

illustrations include examples (viii) and (xiii) below). C. Sachs, The history of musical instruments, New York, 1940, 136 f. H. Panum, Stringed instruments of the Middle Ages, London, 1940 (revised and edited by Jeffrey Pulver, from Middelalderens Strengeinstrumenter, Copenhagen, 1915), 188 ff.: informative and copiously illustrated, but to be used with caution: the 'paraphonic monochord' of Ptolemy (p. 190) is a chimera (cf. I. Düring, Ptolemaios u. Porphyrios über die Musik 243 n.1).

- <sup>2</sup> Both terms are here used generically. Lyres include kitharas. Some writers confine the term 'lute' to later varieties with a broad sound-box.
  - <sup>3</sup> Cf. CQ n.s. vi (1956) 169 ff., esp. 183-6.
  - 4 See n. 23 below.
- <sup>5</sup> For the possible survival of an ancient lute into modern times, see App. B.
  - <sup>6</sup> AA 1954, 286, fig. 19, and refs.
- <sup>7</sup> Uncatalogued (originally in the Weber Collection). Registration no. 1919. 6-20. 7. Ht. 0.17.

of the base in one piece with the body (instead of the more common strip of clay attached separately) are all early signs and suggest a date between 330 and 300 B.C.

- (iii) A rather better piece of the same kind comes from Alexandria, and is now in the Alexandria Museum.8
- (iv) Better still is a third example in the Louvre, said to come from Tanagra. 9 (PLATE XVI 3, 4.) A draped woman, perhaps a Muse, sits on a rock and plays a lute (the upper part of which is missing, though the left hand is partly preserved). This figure somewhat resembles the Muse on the Mantinea base (xiii), though, as will be seen, the type of the instrument is different.

Figures of Eros playing the lute, another Early Hellenistic subject, are rather more common. To judge from their style, the six following pieces were all made between 330 and 200 B.C.

- (v) PLATE XVII I shows a piece in the British Museum from Eretria. 10 The whole upper part of the instrument, with the player's left hand, has broken away, but the pose and the surviving sound-box leave no doubt of what is intended.
  - (vi) An example in the Louvre from Myrina.<sup>11</sup> (PLATE XVII 2.)
  - (vii) An example in the Louvre from Cyprus.12
  - (viii) An example in Stuttgart from Alexandria.<sup>13</sup>
  - (ix) An example in the Collection Fouquet from Lower Egypt.<sup>14</sup>
- (x) There is another figure in Alexandria of a boy—or perhaps an Eros—in Oriental costume, playing the lute.15
- (xi) One more terracotta from Egypt may be mentioned, although it is evidently somewhat later in date, perhaps as late as the first century A.D. It represents a grotesque dwarf and comes from Memphis.<sup>16</sup>

In addition to these terracottas, we have the following two examples.

(xii) On a Campanian squat lekythos from Canosa is a female figure in relief. stands on an Ionic capital and is apparently playing a musical instrument, which can only be a lute. To her left and right are painted figures, Nike and Athena respectively. The vase, now in the British Museum, is attributed by Professor A. D. Trendall to the Branicki Painter, a member of the Rhomboid Group, and dated c. 320 B.C.<sup>17</sup> The workmanship of the plastic figure is extremely poor, and no reliance can be placed upon the details of the instrument.

Our final example is from a sculptured relief.

(xiii) One of the Muses on the Mantinea base is playing a lute. 18 The middle part is badly damaged, but the nature of the instrument is unmistakable. (PLATE XVII 3).

What do we learn from these representations about the character and technique of the

- 8 E. Breccia, Terrecotte figurate . . . del Museo di Alessandria i (1930), pl. F2, no. 83.
- <sup>9</sup> CA 574. REG viii (1895) 374, fig. 2.; G. Kinsky, Geschichte der Musik in Bildern (1929) 14 (3).

10 Cat. no. C 192. Ht. 0.12.

- <sup>11</sup> MYR 686. S. Mollard-Besques, Catalogue raisonné des figurines et reliefs en terre-cuite grecs et romains, ii, Myrina (1963), pl. 71 d. REG viii (1895) 376 fig. 3.
- 12 Winter, Die antiken Terrakotten, iii, pt. 2, 293,
- fig. 7 (drawing, not photograph).

  13 Expedition Ernst von Sieglin, ii, pt. 2, pl. 42:2. Kinsky, op. cit., 14 (5). F. Behn, Musikleben im Altertum und frühen Mittelalter (1954), fig. 52.
- <sup>14</sup> P. Perdrizet, Les terres cuites grecques d'Egypte de la Collection Fouquet (1921), pl. 37.2, no. 241. Closely

- similar to the preceding and possibly from the same
- 15 Breccia, op.cit., pl. 18.6, no. 151. (no. 84, the fragment of a lute-player, is not illustrated.)

<sup>16</sup> Perdrizet, op. cit., pl. 63.6, no. 454.

- 17 B.M. Cat. of Vases iv (1896), no. G 21. The attribution and dating have been courteously communicated to us by Professor Trendall.
- <sup>18</sup> REG viii (1895) 374, fig. 1. G. Fougères, Mantinée (1898), pl. 3. Kinsky, op. cit., 14 (1). M. Wegner, Das Musikleben der Griechen, pl. 32b; Musikgeschichte in Bildern ii 4 (Griechenland), fig. 67. (The last two titles are abbreviated in later references as Musikleben and M. in B.)

instruments represented? The first thing to observe is that they are of two different types, distinguished by the shape of the sound-box.

Type A. In the less common type, of which there are three examples, the sound-box is roughly spade-shaped; the lower end is straight; the distinction between sound-box and neck is clearly marked. In the best examples—(v) and (xiii) (PLATE XVII 1, 3)—the sides of the sound-box converge slightly towards the neck and then curve sharply inwards to meet it (this is lost on one side of (xiii)). The sound-box of (v) is somewhat narrower in proportion than that of (xiii), but recognisably of the same type. The workmanship and condition of (i) are poor.<sup>19</sup> If, as it would appear, the instrument is completely shown, sound-box and neck are of approximately equal length. In (xiii) the proportion of neck to sound-box is about 2:1. In (v) the sound-box only is preserved, but from the position of the left arm (and the general proportions of the figure) it seems unlikely that the neck was longer—or substantially longer—than the sound-box.

Type B. In all the other examples the sound-box ends in a bluntish point. Its widest part is near the end, and it then tapers into the neck, the line being continuous on each side without any clear demarcation between sound-box and neck. The instrument as a whole could be described as club-shaped. (PLATES XVI 1-4, XVII 2.)

In some cases (of both types) the neck is shown to widen out slightly at the end opposite the sound-box, e.g. (iii), (vi), (xiii). (vi) has a raised band at the end; (xiii) has a raised band 1 cm. wide at a distance of 1.5 cm. from the end. There is never any sign of tuningpegs (still less of a bent-back peg-box, as in later lutes): it would seem that, as with most early eastern lutes, the strings were simply ligatured. There appears to be an indication of frets in (viii), but not elsewhere. There is no indication of strings, except in (ii), where the incised lines are probably original and intended to represent strings (four or perhaps five), and possibly in (viii), where, however, the traces of lines parallel to the instrument are seen on the neck only.<sup>20</sup>

The instrument is most commonly held horizontally. The position of the hands varies little: the left hand should be thought of as stopping a string, the right hand as plucking it (in (iv) and (v)—PLATES XVI 3, 4, XVII 1—it has just been plucked). It is not always clear whether a plectrum is being used, as was the case with Oriental lutes. The plectrum is certain in (vi) and (xiii) (where the relevant projection is much too prominent for the end of the thumb). On the other hand, there is no plectrum in (iv) or (v), and probably none in (iii), (viii) or (xi). (Note that this is not a distinction between Type A and Type B.)

In Type B, a small projection or knob is visible at the end of the sound-box in examples (iii), (vi), (vii), and (x). It is possible that the strings were fastened to this knob before passing over a bridge to the neck. It is on the whole more likely that it is a residual feature, going back to the primitive lute in which the sound-box was pierced by a long stick.<sup>21</sup> At that early stage the strings were fastened to the projecting end of the stick, but in more sophisticated instruments the function of 'tail-piece' is taken over by a bridge attached to the top of the sound-box. Such a bridge or tail-piece is clearly indicated in (iv), (v), and (vi).

Finally, as to the depth and section of the sound-box, we ought not perhaps to expect too much information from terracottas and reliefs. In terracottas the back of the sound-box tends to be amalgamated with the body of the figure. By a happy chance, however, in (iv), which is of careful workmanship, the instrument is held away from the body of the player, so that a good profile view is obtainable from above and below (cf. PLATE XVI 4). Doubt-

<sup>&</sup>lt;sup>19</sup> There seems to be a vertical ridge slightly right of centre which is probably devoid of significance.

<sup>&</sup>lt;sup>20</sup> Panum, Stringed Instruments fig. 176, shows the lines continuing to the end of the sound-box, but the picture seems to have been 'touched up'.

<sup>&</sup>lt;sup>21</sup> We owe this suggestion to Mme. M. Duchesne-Guillemin. A similar projection is to be found in two published Byzantine lutes: Farmer (see n. 1), pl. 13; BCH lxxxvi (1962) 693.

less all Type B instruments were similarly shaped.<sup>22</sup> As to Type A, (v) indicates the depth at the sides, but tells us nothing of the vault. In (xiii), however, the triangular end (recessed by 3-4 cm.) represents depth. The kithara played by a Muse on one of the other sides of the Mantinea base (PLATE XVII 4) has a similar recessed triangular base, which is also shown (or implied) in representations of kitharas on coins and in terracottas. It seems reasonable to suppose that the sound-box of the Type A lute was vaulted like that of a kithara, with a central spine. (The evidence for kitharas is examined in Appendix A.)

\* \* \* \* \*

Two distinct types of lute, then, were known in the Greek world during the late fourth century and after. The relations of these types to earlier Oriental and Egyptian lutes, and their subsequent history in Roman and medieval times, both in Europe and in Asia, are matters which we must leave to qualified organologists.<sup>23</sup> But there are two further questions on which something must be said: the question of nomenclature, the question of the date of introduction.

Having distinguished two types of instrument by the difference in the shape of the sound-box, are we in a position to name them? Or to name lutes in general?

It is commonly assumed that the *pandoura* (*pandouros*, *pandourion*) was a lute; and, although the evidence could be more specific, we need not doubt that this is correct. There are three principal passages.

- (i) In Athenaeus iv 183 f it is stated that the 'so-called pandouros' was mentioned by Euphorion<sup>24</sup> and by Protagorides; and that Pythagoras 'who wrote about the Red Sea' said that the Troglodytes made the pandoura of the laurel which grows in the sea.
- (ii) Pollux iv 59 ff. has a long section on stringed instruments which contains the following items: μονόχορδον δέ, 'Αράβων τὸ εὔρημα. τρίχορδον δέ, ὅπερ 'Ασσύριοι πανδοῦραν ἀνόμαζον ἐκείνων δὲ ἦν καὶ τὸ εὔρημα. Both instruments were presumably of the lute-type. What authority Pollux had for a one-stringed Arabian lute we cannot say. The Greeks were familiar<sup>25</sup> with the monochord kanon as an instrument of acoustical research and must have recognised that, since both were based upon the principle of the stopped string, there was a kinship between it and the lute. The equation is made, if confusedly, in the next passage.
- (iii) Nicomachus, harm. enchir. ch. 4 (243, 13 ff. Jan): μέσα δ' αὐτῶν (i.e. between wind and stringed instruments)<sup>26</sup> καὶ οἷον κοινὰ καὶ ὁμοιοπαθῆ τά τε μονόχορδα φαίνεσθαι, ἃ δὴ καὶ φανδούρους καλοῦσιν οἱ πολλοί, κανόνας δ' οἱ Πυθαγορικοί. One MS. has πανδούρους for
- <sup>22</sup> Some attempt is made in (vi) to render this shape at the lower end, but it soon amalgamates with the human body. It may be that we get a good picture of the profile in an unexpected quarter.  $\pi a \nu \delta o \tilde{\nu} \rho a$ is glossed in Suidas (s. vv. 'πηκτίς', 'πανδοῦρα') as μάχαιρα κρεωκόπος. Cf. Zonaras: πανδούριον μάχαιρα σφακτική. References for μάχαιρα, in the sense of chopper or cleaver, will be found in B. A. Sparkes, 'The Greek Kitchen', JHS lxxxii (1962) 132; and his pl. 8.6 (there is a clearer picture in P. Devambez, Greek Painting, The Contact History of Art, London, 1962, pl. 68) shows how this implement might have acquired the nickname of pandourion (in the same way that the nickname of sambuke was given to a siege-engine because of its shape—see n. 34). In other examples of cleavers, however, the top is more strongly curved, and the comparison would be less
- <sup>23</sup> In addition to the general works mentioned in n. 1: F. Behn, Musikleben im Altertum und früher Mittelalter, 1964. The New Oxford History of Music i, passim, VOL. LXXV

with good bibliographies. Musik in Geschichte und Gegenwart, s.v. 'Laute' (viii 345ff.): the section on 'Die aussereuropäischen und antiken Lauten' is by H. Hickmann (full bibliography). Musical instruments through the ages, ed. A. Baines, Pelican Books, 1961, is informative and well illustrated.

24 There is a reference back to 182 e: οἱ νῦν, φησίν (sc. Euphorion), καλούμενοι ναβλισταὶ καὶ πανδουρισταὶ καὶ σαμβυκισταὶ καινῷ μὲν οὐδενὶ χρῶνται ὀργάνῳ. In the passage quoted, Euphorion gives evidence for the antiquity of the sambuke, but nothing further is said about the pandoura (or pandouros).

<sup>25</sup> From what date? It is often assumed that the use of the *kanon* as an instrument of research goes back to Pythagoras or the early Pythagoreans, but B. I. van der Waerden has argued (*Hermes* lxxviii (1943) 177) that it dates from Strato.

<sup>26</sup> It is not clear on what grounds the various instruments mentioned, including the *trigonon* and the *plagiaulos*, are regarded as intermediate between wind and strings.

φανδούρους. The name, however spelled, is here applied to a monochord, not, as in Pollux, to a trichord.

However unsatisfactory this evidence may be in detail, it seems to establish for the pandoura (or pandouros) both its lute-character and its exotic origins, which Pollux places in Assyria (the monochord coming from Arabia) and Pythagoras on the shores of the Red Sea. It is associated with Egypt by Martianus Capella (ix 924). The name, like those of most Greek musical instruments, is undoubtedly non-Greek, and attempts have been made to give it a Sumerian derivation.<sup>27</sup> Later derivatives, e.g. tanbur, mandoline (from mandora), relate to lute-type instruments.<sup>28</sup>

One name is perhaps enough, but it would be agreeable if we could find another. The names are known of a considerable number of exotic instruments. Scholars of the Hellenistic period were interested, but, to judge by the discussions in Athenaeus iv and xiv, not particularly well informed. There are reasons for believing that many, if not most, of these instruments were varieties of harp.<sup>29</sup> The name pektis  $(\pi\eta\kappa\tau's)$  was certainly given to a harp, identical with or closely similar to the magadis, but it was also given to the syrinx and may have been given to a lute. The word is glossed by Hesychius as  $\pi\alpha\nu\delta\circ\acute\nu\rho\iota\circ\nu\cdot\psi\alpha\lambda\tau\acute\eta\rho\iota\circ\nu\cdot\sigma\hat\nu\rho\iota\gamma\acute\xi$ , and we find similar glosses in Suidas and Photius. The question is open.<sup>30</sup> There is a rather stronger, if not an overwhelming, case for regarding the skindapsos as a lute. The evidence is as follows:

- (i) Pollux iv 59. A long list of stringed instruments begins with lyres, continues with harps (though some are doubtful), and ends with skindapsos. This might be a reasonable position in which to place a lute, if lute it is. However, the pandoura comes later (v. supra).
- (ii) Athenaeus iv 182 f cites from Aristoxenus (fr. 97 Wehrli) a list of exotic instruments (ἔκφυλα ὄργανα). In this list σκινδαψούς comes between κλεψιάμβους and τὸ ἐννεάχορδον καλούμενον. The latter cannot be a lute, and we have no reason to suppose the former is. There was of course no bar to mentioning a lute between harps (if they were harps).31
- (iii) Athenaeus xiv 636 b. The list cited from Phillis of Delos is probably derived from that of Aristoxenus: it has the skindapsos in the same position.<sup>32</sup>

More informative is a short passage specifically on the skindapsos in Athenaeus iv 183 a-b, with quotations from Matron, Theopompus of Colophon, and Anaxilas. None of them, however, is free from difficulties. To take the last first:

(iv) Anaxilas (Luropoios fr. 267):

έγω δε βαρβίτους τριχόρδους πηκτίδας κιθάρας λύρας σκινδαψούς εξηρτυόμαν.

The speaker is presumably the lyre-maker himself.<sup>33</sup> Three of his instruments are of the

- <sup>27</sup> Cf. New Oxford History of Music, i 244 f. (H. G. Farmer), citing F. W. Galpin, The Music of the Sumerians (1937) 35 and C. Sachs, The History of Musical Instruments (1940) 82.
- <sup>28</sup> This might seem to clinch the argument, but one must be cautious. Cithern and guitar are derived from  $\kappa\iota\theta\acute{a}\rho a$ , though instruments of a quite different character. As Dr E. K. Borthwick reminds us, the cor anglais is not a horn nor the tromba marina a trumpet!
- <sup>29</sup> The time is perhaps ripe for a comprehensive investigation of these problems in relation to the monumental evidence, but C. von Jan, de fidibus Graecorum (1859), Die griechischen Saiteninstrumente (1882), H. Riemann, Handbuch der Musikgeschichte i 1, 91ff., are still valuable. On the balance fo evidence the nabla was a harp, not a lute (cf. Jan, Saiteninstrumente 19 f.).
- 30 Sopater (ap. Athen. iv 183b) calls the instrument  $\delta \ell \chi o \rho \delta o \varsigma$ , but this is not conclusive, since the reference may be to stringing in 'double courses' (cf. Jan, Saiteninstrumente n. 134; Riemann, op. cit., 92).
- <sup>31</sup> Which is what Euphorion seems to have done in the passage cited in n. 24.
- $^{32}$  The lists are identical, except that Phillis has  $la\mu β \tilde{\nu} \kappa a \iota a \mu \delta \tilde{\nu} \kappa a \iota a$  the supposed that it has dropped out of the quotation from Aristoxenus.
- 33 Speaking Doric? Cobet, to mend the metre in the second line and to fit  $\dot{\epsilon}\xi\eta\rho\tau\nu\delta\mu\alpha\nu$ , reads  $\beta\alpha\rho\betai\tau\sigma\varsigma$  τριχόρδος πακτίδας . . . σκινδάψος. This does not affect our problem, but τριχόρδονς (or τριχόρδος) may. It cannot be an epithet of  $\beta\alpha\rho\betai\tau\sigma\nu\varsigma$  nor yet of  $\pi\eta\kappa\tau i\delta\alpha\varsigma$  if those are harps, which is more probable

lyre-type: barbitos, lyre and kithara. The pektis is most probably a harp; the skindapsos could be a lute; τριχόρδουs is problematic.

### (v) Matron:

οὐδ' ἀπὸ πασσαλόφιν κρέμασαν, ὅθι περ τετάνυστο σκινδαψὸς τετράχορδος ἀνηλακάτοιο γυναικός.

That the skindapsos is here described as having four strings is the most positive evidence we possess for calling it a lute. It is not conclusive, since a very small harp might perhaps have had no more.<sup>34</sup> However, the following passage indicates that the skindapsos was not a small instrument.

### (vi) Theopompus:

σκινδαψον λυρόεντα μέγαν χείρεσσι τινάσσων δξύινον προμάλοιο τετυγμένον αίζήεντος.

So the skindapsos was large, but it was also 'lyre-like'. Was it then a lyre-type instrument after all? Hardly, if it had four strings. The case for regarding the skindapsos as a lute depends greatly on this one epithet in Matron, but it is by no means negligible. 36

By way of names, then, we have pandoura (which is virtually certain), skindapsos (which is quite probable), pektis (which is possible),<sup>37</sup> but small grounds, if any, for assigning them to either of the two types of lute which we have distinguished. The skindapsos alone carries epithets which might assist an identification. It was large; and of all the representations we have reviewed, perhaps the Mantinea lute (xiii) alone deserves the epithet  $\mu \acute{e}\gamma as$ . But we have no reason to suppose that the other Type A lutes were larger than those of Type B.<sup>38</sup> It was lyre-like. Now there would seem to be no obvious point of comparison between the Type B lute and the lyre,<sup>39</sup> but the sound-box of the Type A lute was, as has been argued above, vaulted upon the same principle of construction as the kithara, and the epithet migh,

(but see above). If it is a substantive instrument, the gender seems improbable, and we should perhaps suppose that an original  $\tau\rho i\chi o\rho\delta a$  has been assimilated to its surroundings. Pollux iv 60 (v. supra) equates trichordon with pandoura, so that the lyre-maker's list may in fact include two kinds of lute. On this passage see Riemann, op. cit., 91.

34 From Athenaeus xiv 633 f we learn that the sambuke was a high-pitched instrument (which is confirmed by Aristides Quintilianus de musica 85. 10 ff. Teubner); and, if the text is right, that it had four strings, being employed by the Parthians and the Troglodytes. We have no certain example of the sambuke in art, though the small harp with boatshaped sound-box in Behn, op. cit., fig. 127 may be a claimant. (The boat shape may have a bearing on the vexed question of the siege-engine of this name referred to in the following sentence of Athenaeus and described at length in Polybius viii ch. 4, B.-W. ii 336, 25-337, 29.) A harp of this size is likely to have had few strings. It is conceivable that there has been some confusion in the text of Athenaeus and that the latter part of the sentence relates to the pandoura, associated with the Troglodytes by Pythagoras (v. supra), who is also cited as an authority here. However, the following sentences continue to deal with the sambuke.

- 35 In the second line, one wood or two? No authority is very specific about the πρόμαλος: it is coupled with the lτέα in Ap. Rhod. iii 201; its twigs or leaves can provide a couch (Athen. xv 673 c); Hesychius glosses as μνρίκη η ἄγνος; other references are noncommittal. Kaibel emends δξύινον to οlσύινον—a word normally applied to objects made of plaited osiers, as no musical instrument could be, though willow-wood might be a possible material.
- <sup>36</sup> According to Aelian, *NA* xii 44, the instrument was of Indian origin, which would consist with its being a lute.
  - <sup>37</sup> And perhaps trichordos or trichordon (see n. 33).
- <sup>38</sup> The epithet may distinguish one skindapsos from another rather than the skindapsos as such from smaller instruments: a *large* skindapsos?
- <sup>39</sup> We hesitate to complicate the issue by referring to three sarcophagi of the Roman period—two in the Louvre and one in the cathedral at Agrigento—which show an instrument very similar in shape to our Type B lute, but with a relatively large number of strings, held upright against the shoulder and played, apparently, without 'stopping', like a lyre or (Sachs) zither. Cf. Panum, op. cit., 212 f., figs 185–7; Sachs, op. cit., 137, pl. 8 B. There is, however, no earlier evidence for this type.

have been prompted by this resemblance. Clearly, however, the evidence admits of only the most tentative hypotheses.<sup>40</sup>

\* \* \* \* \*

From the evidence of the terracottas alone one might conclude that the lute was probably not employed in Greece before the time of Alexander the Great and was perhaps introduced as a result of his conquests. One literary witness may suggest a slightly earlier date. The skindapsos is mentioned, among fourth-century writers, by Aristoxenus, Matron and Anaxilas.<sup>41</sup> Aristoxenus was born about 360 B.C.; we cannot date his  $\pi\epsilon\rho i \ \partial\rho\gamma\acute{a}\nu\omega\nu$  (or his death). Matron is thought to be contemporary with Alexander. Anaxilas, however, burlesques Plato, who died in 347; according to Webster,<sup>42</sup> his Kirke is to be dated before 350, his Euandria 350–340, his Neottis 340–330. There seem to be no grounds for dating the Luropoios,<sup>43</sup> but there must be some probability that it is earlier than the conquests of Alexander. He mentions the skindapsos,<sup>44</sup> and the skindapsos may be a lute.

The pre-Alexandrian introduction of the lute would be settled, if a date in the middle of the fourth century were accepted for the sculptures on the Mantinea base. Not many scholars perhaps would now place it so early.<sup>45</sup> We do not wish, however, to enter into the details of this controversy, except insofar as the representations of musical instruments on the reliefs might have a bearing upon the question of date. (i) There is the lute. (ii) There is the type of kithara held by one of the Muses.

- (i) The fact that all other examples of lute-type instruments are later than 330 B.C. does not prove that this example is itself so late. Nevertheless, the earlier the date the more surprising perhaps to find this new-fangled instrument in the hands of a Muse of all players and at Mantinea of all places. Too much weight should not be put upon the first point, since the Muses sometimes disconcert us by their choice of instruments. They play the harp, the syrinx, the tambourine, and perhaps also the krotala. An obscure archaic sculptor called Lesbothemis is said to have made a Muse playing the sambuke, apparently a small harp of high pitch and regarded as exotic. But that was in Mytilene, close to the Asiatic sources of corruption. Mantinea, however, was famous for the strict classical tradition of its school of music; and one modern writer is prompted to speak of cette Arcadie musicale où les innovations modernes n'avaient pas apporté la discorde'! When Aris-
- $^{40}$  But see n. 22 for a possible link between the pandoura and Type B.
- <sup>41</sup> There seems to be no evidence for the date of Theopompus of Colophon.
- <sup>42</sup> CQ n.s. ii (1952) 13 ff., esp. 17, 19, 21; Studies in Later Greek Comedy 44, 61, and Chronological Table.
- $^{43}$  Or the *Auletes*, which (fr. 27) also satirises the 'new' music.
  - 44 See also n. 33.
- <sup>45</sup> Cf. A. W. Lawrence, Classical Sculpture 254; Later Greek Sculpture 102 (and references). Most recently, F. Hiller, Marburger Wincklemann-Programm 1962, 54 ff., n. 17, who argues for 330–325 B.C.
- <sup>46</sup> Harps: e.g. Terpsichore on a r.f. amphora, British Museum E 271 (Wegner, *Musikleben* pl. 19; *M. in B.* fig. 22); volute krater by the Sisyphus Painter, Munich 3268 (Wegner, *Musikleben* pl. 22; see Register 203–4 for other examples).

Syrinx: Calliope on the François Vase (Wegner, Musikleben pl. 2a); white ground pyxis, Boston 98. 887 (Wegner, M. in B. fig. 23).

Tambourine (tympanon): Erato on a pelike by the Meidias Painter in the Metropolitan Museum of Art (G. M. A. Richter, A7A xliii (1939) 1 ff.).

Krotala: if the four females attending on Apollo on a b.f. amphora, Copenhagen 3241, are Muses (Wegner, Musikleben pl. 28a, Register 213, contr. M. in B. p. 50 ad inf.). The same question arises on a b.f. lekythos, Paris MNB 910 (L 27), cf. Haspels, Black-figure Lekythoi pl. 32. 2.

- $^{47}$  Athenaeus iv 182 f, xiv 635 a (Overbeck B. 2083).
  - <sup>48</sup> See n. 34.
- <sup>49</sup> L. Laloy, Aristoxène de Tarente 7 ff. Cf. G. Fougères, Mantinée 347 f. On the strictness of the Mantineans, see Plutarch, de mus. ch. 32, §§ 329–30 W.–R., with Reinach's note; cf. Philodemus, de mus. xi 77 fr. 9 (I xix 2 van K.). From Polybius iv 20 we learn that the Arcadians were still concerned to give their children a sound musical education in the second century B.C.; if Philoxenus and Timotheus have now been added to the curriculum, this is the normal process by which the revolutionaries of one generation become the classics of another. From the anecdote in Xenophon, Anabasis vi 1.11, one gets the impression perhaps that the Mantineans were traditionalists!

toxenus went to Mantinea to study about 340, did he find that a sculptor had already honoured a local cult by placing in the hands of a Muse a type of instrument recently imported from Asia to be the butt of comic poets?<sup>50</sup> The point is subjective and not to be pressed, but the later the date the happier one will feel.

(ii) Two types of kithara are exemplified on the reliefs. The instrument held by Apollo is in all respects that of the professional kitharodes, familiar from countless vase-paintings of the archaic and classical periods and still seen on coins and in terracottas of the Hellenistic age. It is natural enough that a Muse should play a simpler form of kithara than the god; and in the fifth century it might have been the so-called 'cradle-kithara' with rounded base (played by a Muse on a volute-crater by the Sisyphus painter—Munich 3268—and else-The type represented on the Mantinea base (PLATE XVII 4) is more like a greatly simplified version of the kitharodic instrument. Its most striking feature is its The sides of the sound-box are straight and at right angles to the base, and the line is continued into the side-pieces. The lines must have been straight to the strict frontal view, for, when we observe a marked curvature of the left-hand arm and a slighter corresponding curvature of the right-hand arm, there can be no doubt (in view of parallel cases) that this is a conventional representation of the third dimension, indicating that the front of the instrument is not in one plane, but curves over at the top in such a way that a plumb-line from the yoke would fall well away from, and forward of, the base. It is easy to understand that, when fashion or convenience brought the yoke forward in relation to the sound-box, curvature in the one plane was sacrificed to curvature in the other.<sup>51</sup> This combination of forward curvature with frontal rectangularity may have been common in the Hellenistic period to judge by terracottas and some other evidence.<sup>52</sup> But it is found already in the fourth century: on two Apulian vases in the British Museum (F 309 and F 399), dated c. 370-360 and c. 350, respectively, and—rather later—on a Gnathia bell-krater in Naples (late fourth or early third century).<sup>53</sup> Such fourth-century evidence as we have seen comes from Italy, but the terracottas show that this form of kithara was known in Greece at a rather later period.<sup>54</sup> Its presence on the Mantinea relief can, no more than that of a lute, provide conclusive evidence of date.

### Appendix A: on back-views of the kithara

On the Mantinea reliefs both the lute and the Muse's kithara have a recessed triangle at the base of the instrument, which is clearly an indication of the shape of the sound-box. This agrees with other monumental evidence.

The great majority of our representations of kitharas are on vase-paintings—and are front-views, i.e. they show the side on which the strings pass over the flat upper surface of the sound-box. This is also true of lyres, but the back of the tortoise-shell is sometimes shown,

- <sup>50</sup> One can hardly say that he was running short of instruments. The fourth side of the base, with three of the Muses, is unfortunately missing, but it need not have contained more than one instrumentalist.
- 51 In the classical kithara the strings are fastened to a holder or tailpiece near the base and then pass over a bridge on their way to the yoke. The function of the bridge is to keep the strings from contact with the sound-box. If the yoke is brought forward, a bridge is no longer necessary; and it would seem that the former bridge now takes on the function of tailpiece.
- <sup>52</sup> Terracottas: e.g. in the Louvre CA 708 (with a close similarity to the Muse's kithara), 799, 2297; MYR 85, 178, 303. A coin from Brundusium (BICS x
- (1963), pl. 9.6) of c. 150-100 B.C. A fresco from Herculaneum in Naples (cf. The New Oxford History of Music i pl. 12). A statue of Apollo in the Vatican (cf. Behn, op. cit., fig. 112). See further Jan, Saiteninstrumente, n. 47. (A thorough study of kitharashapes from the fourth century onwards is much to be desired.)
- <sup>53</sup> Naples, Museo Nazionale, 80084 (Wegner, M. in B. fig. 70).
- <sup>54</sup> Two lyres by the Meidias Painter—on a hydria in Florence (Devambez, op. cit., pl. 138) and on a pelike in New York (see n. 46)—might be interpreted as showing a forward curvature, but it seems more likely that they represent the same normal type as that shown in the Pronomos vase to the left of the poet.

and we know from our own experience what shape it is in three dimensions. When we see the back-view of a kithara, as on the breast-plate from Olympia,<sup>55</sup> if the technique is purely linear, we cannot guess whether it is flat or vaulted. It comes, therefore, almost as a shock to see the great bulging sound-box shown in a profile view on a metope from Delphi.<sup>56</sup> This is dated to the middle of the sixth century. It is not until much later that we find relatively plentiful evidence in reliefs, terracottas, and coins, which combine to give a consistent picture: a vault of moderate depth, a central spine curving over to a point (visible also on the front-view) in the middle of the top of the sound-box, a triangular base.

A good example is provided by a relief in the National Museum at Athens (1966), dated to the turn of the first century B.C.<sup>57</sup> Apollo holds his kithara reversed. The triangular base is implied rather than seen, but the spine is well marked: the relief is highest at a point slightly below the apex, towards which the spine curves sharply over; from the spine the sound-box slopes smoothly away to left and right; there is a slight indication of depth at the Terracottas vary greatly in the care with which the back of the kithara is represented, especially in front-views. A good example from the Louvre is MYR 636, where the kithara is held in the reverse position. The relief is shallow, but there is a distinct recession on both sides from a central spine, and on the spine from near the apex towards the bottom.<sup>58</sup> It may well be that the sculptors and mould-makers found it convenient to make the vault less prominent than it in fact was, but of this we cannot be sure. The examples so far given are Hellenistic, but the shape is taken back at least to c. 400 B.c. by the evidence of coins<sup>59</sup> which show back-views of kitharas, with spine and triangular base. (The triangular base is seen on coins also in front-views, as on the Mantinea relief.) The vaulting is perhaps deeper in proportion than in the examples we have quoted, and its deepest point is considerably lower than the apex: otherwise the similarity is close. Good examples in the British Museum collection are: Lesbos Electrum 61-63 (322-24 Anson), of the late fifth or early fourth century; Methymna 12-13 (325-26 Anson), of the late fourth century; Methymna 10 (Guide, pl. 18.30), of c. 400; a coin of Tissaphernes (Guide, pl. 19.41), of c. 400. (It is salutary to observe that features which might otherwise be regarded as Hellenistic are dated back in this way.)

### Appendix B

There is some evidence that a lute was discovered in corpore in an Attic tomb in the early nineteenth century, but it has apparently perished. (Magasin Encyclopédique, 1807, ii, 363 f.; Dilettanti Society, Unedited Antiquities of Attica, 4.)

In or shortly before the year 1806, Monsieur Fauvel, a French Consular official in Athens, discovered a tomb near Athens on the road to Eleusis. It contained a marble sarcophagus; in the sarcophagus was a wooden coffin with ivory embellishments, palmettes, etc., 'like those on the Erechtheum, but finer'; in the coffin was the skeleton of a woman wearing an olive wreath of gilt bronze. At her feet were a wooden comb and the remains of an instrument described variously as resembling a violin or a guitar of maple with sides of pine. The shape of the instrument was lost, but it was half an inch thick at the edges and at least a foot long.

There was also a pair of sandals; pieces of wood and bone an inch and a half long which fitted together; a vase and a plate of black glaze; and an iron strigil.

the Herculaneum fresco (see n. 52), also a backview.

<sup>&</sup>lt;sup>55</sup> Wegner, *M. in B.* fig. 20.

<sup>&</sup>lt;sup>56</sup> Wegner, Musikleben pl. 3b; M. in B. fig. 31. Some evidence for vaulting, and for triangular section (see below), in Jan, Saiteninstrumente n. 45.

<sup>&</sup>lt;sup>57</sup> Wegner, M. in B. fig. 29.

<sup>58</sup> The same general shape can be discerned in

<sup>&</sup>lt;sup>59</sup> For lyres and kitharas on coins, see L. Anson, *Numismata Graeca*, part vi, pls. 3-7. Examples will also be found in the British Museum *Guide to the Principal Coins of the Greeks*.

Can we date this tomb? The embellishments of the coffin can scarcely be before the late fifth century. It can probably be dated later still. In the fifth or the fourth century down to 330 a tomb as rich as this would almost certainly have contained figured pottery. Black glaze in a tomb of this nature suggests the third century or later. After the second century the pottery would probably have been red glaze. We are therefore left with a tentative date for the tomb, and therefore for the lute, in the third or second century B.C.<sup>60</sup>

British Museum, London. King's College, London. R. A. HIGGINS. R. P. WINNINGTON-INGRAM.

<sup>60</sup> We wish to acknowledge with gratitude the help we have received from Dr E. K. Borthwick, Mme M. Duchesne-Guillemin, Mr G. K. Jenkins, Mme S.

Mollard-Besques, Mr Michael Morrow, Miss B. Philippaki, Dr B. A. Sparkes, Professor A. D. Trendall, and Professor Max Wegner.

PLATE XVI JHS lxxxv (1965)





1, 2 British Museum 1919.6-20.7 (See p. 62—example (ii))





1, 2 Louvre CA 574 (See p. 63—example (iv))

LUTE PLAYERS IN GREEK ART

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1 British Museum C192 (See p. 63—example (v))



2 Louvre MYR 686 (See p. 63—example (vi))



3 Athens, National Museum 216 (See p. 63—example (xiii))



4 Athens, National Museum 217 (See p. 65)



Ancient Flutes from Egypt Author(s): T. Lea Southgate

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## ANCIENT FLUTES FROM EGYPT.

In examining and dealing with the fragments of some Flutes found by Professor Garstang during his excavations at the Royal City of Meroë, about fifty miles from Khartoum in the Sûdân, a brief consideration may perhaps be permitted respecting the conditions which obtained at this old Nubian capital on the Upper Nile, so far as they appertain to a phase of music long passed away. It may aid in tracing the origin of these particular flutes, and determining whether they are of local workmanship, or imported.

Kush, an ancient kingdom comprised in Ethiopia, later became one of the dependencies of Egypt proper. From the period of the invasion of Cambyses, B.C. 530, his seizure and destruction of Thebes, the island city of Meroë, decreed by the conqueror to be the capital of the province, became a great trade emporium. Greek influence then began to obtain in the land of the Nile. Although of course the customs, arts, and learning of the more ancient Egyptians extensively prevailed among these more southern people, Meroë was a place of great importance, possessing enough rich and cultured persons to import for use and enjoyment products of art from notable places beyond the Egyptian shores of the Mediterranean.

So much is said in justification of the opinion that, however original and characteristic were the early instruments and music of the Egyptians proper, dating back quite to B.C. 3000, in later times Greece returned to the land of the Pharaohs some of the debt originally incurred with regard to the theory and practice of music when Pythagoras went there and studied the art. We know that this condition was specially the case with the later flutes, and it should be remarked that of old the term 'Flute' was applied to all instruments of the pipe family whether played with reeds, or true flue-blown. There was from time immemorial a great demand for flute music for solemn ceremonies and a number of social purposes.

The Nay, cut from the thick strong stalk of the arundo donax, the common water-plant of the Nile, is simply a hollow stem open from end to end, and pierced with a few finger-holes; it has been played in Egypt for thousands of years. This nay is the origin of the entire flute tribe, also of all the flue pipes of the organ; the venerable instrument is still played in Cairo. Almost as old is the Zammah in which pipe the arghool (striking) reed is inserted. It is the origin of our clarinet; when the reed is made with double sides it appertains to the oboe family. The transverse flute

came early into use; whether this is to be regarded as the true maayiavaos of the Greeks, or whether this designation referred to another type need not be critically discussed. Although few examples are extant there are specimens recovered from the ashes of Pompeii, and the British Museum presents an example obtained from Halicarnassus to which later reference will be made. Besides the statements of Herodotus, Strabo, Diodorus Siculus, Plato, Lucian, and Pliny, who tell us much about Egypt, its arts and music, a number of Greek writers describe the prowess of their native flute players. The professional auntai and tibicines were esteemed and highly paid artists, indeed some had statues erected to them following their success in public competitions. As the instrument and its capabilities developed, many of those produced became works of constructive skill and artistic ornamentation, fetching enormous prices. Lucian says that Ismenias of Thebes gave a sum equal to a thousand pounds for a flute at Corinth. Lamia so fascinated her admirers that a temple was erected and divine honours paid to the felicitous flautist. Not only are the names of some of the renowned players preserved, but those of celebrated makers have been recorded, as that of Theodorus mentioned by Plutarch.

The four flutes discovered at Pompeii, now in the Naples Museum, arrest attention in connexion with the recent Meroë find, inasmuch as some identical features are presented, features associated with no other specimens remaining, viz., the revolving rings or broad bands for temporarily closing the finger-holes of notes not wanted in the particular piece about to be played. These Pompeian relics have an inner tube of ivory covered by a bronze exterior; the ventages number from eleven to thirteen. As we do not possess enough fingers to close all these holes (in order to obtain the fundamental or lowest note of the tube) some method of applying artificial fingers had to be contrived. The invention of such a device is ascribed by Pausanias to Pronomus, a Theban. This consists in placing over the ivory lining a number of sliding or revolving rings which could be turned round at will. The inventor claimed that by this mechanical device he could play in any of the principal modes on a single flute, instead of requiring specially constructed instruments for each particular scale. It was an ingenious thought, anticipating the spring pad key in use in to-day's wood-wind instruments; this latter mechanical device came into use in the early sixteenth century. It may be mentioned that, in the four Pompeian flutes, the intervals provided with these closing rings are not the same in all the examples; one possesses six rings. Very remarkable is a ring in one case having a second hole bored at a distance a little lower; it probably yielded an enharmonic interval of a quarter of a tone.

In setting out for inspection these Meroë fragments by ranging them on slender wooden rods fastened to a side frame, it must be understood that no attempt has been made to piece them together as they originally existed. We are not sure as to the length of this type of flute, and a glance at the diameters of the pieces will show that they belonged to different instruments of varying size. The design has been to mount the portions in a convenient

form for preservation, so that they can be readily seen and identified in the descriptive remarks which follow.

Like the Pompeian find, the materials are ivory and bronze; although buried in the ground for 2000 years, they have to a considerable extent defied destruction. A qualitative analysis of some fragments shews that the main portion of the metal was copper, with a considerable amount of tin, and there were traces of iron, magnesium, and nickel; probably these latter metals were impurities, and not deliberately added to the alloy. No doubt the alert makers and players had found that ivory was superior to the favoured sycamore wood, in that the moisture from the breath of the player did not cause the instrument to swell, a defect inseparable from wooden tubes. The bronze is still singularly hard; though covered with an olive green oxide and earthy incrustations, it is quite difficult to file. is very brittle, and unless tenderly handled crumbles to a light brown dust. The bores of the ivory tube and that of the outside bronze are quite true rounds, perfect in their lathe turnings, as tested with callipers. The inner ivory, like the bronze covering, must have been made in sections in order to slip on the revolving rings, and provide a socket for the next portion to fit into. In fact the flute was made in joints just as we construct them now for convenience in carrying about. It may be observed that in putting the instrument together, by changing the position of the several pieces, it was possible to alter the disposition of the finger-holes, and so vary the order of the intervals; the instrument might thus be arranged to suit some particular mode. Judging from the slightly conical outlet pieces preserved, the Meroë fragments indicate five instruments, but there may have been more now broken up and perished. The pieces vary from three and a half inches to under an inch in length. In several examples the round clean cut ends shew that such was the original form, strengthening the impression that each section was designed to fit on to another; certainly the flutes were not made in one piece as were the more ancient instruments. The inner bores, still intact, are from seven-sixteenths to ten-sixteenths of an inch; the bronze covering is of course adapted to fit the varying ivory lining.

The finger-holes are of three types, first round, measuring five-sixteenths to seven-sixteenths; secondly, rectangular oblong, five-sixteenths long by two-sixteenths to four-sixteenths in breadth; thirdly, in an ivory fragment a curved hole having the form of a comma stop in printing; it is eight-sixteenths long, and three-sixteenths at the rounder head, the other end of it comes to a sharp point as the bottom of a comma. Both rectangular and round holes are not found in the same pieces. It would thus seem that there were two main types of finger-holes, but without possessing a perfect instrument for inspection, this cannot be determined, nor is it quite clear what was the distinction in effect between round and squared holes—unless the latter could be more easily half stopped to produce either large or small intervals. In old hautboys can be seen two small holes drilled parallel for the finger to close both, or only one, for chromatic intervals.

What is the chief and remarkable feature in these particular flutes is

the evidence of the revolving ring turning on the tubes; this may be identified on several of the fragments by the small pyramidal-shaped projections or lugs by which these rings could be readily turned. The rings ran loose on slightly grooved reductions made upon the surface of the ivory Their office was to close the finger-hole of a note not wanted for use and foreign to the scale or mode of the piece intended to be played. the hole in the ring and that in the ivory body of the flute corresponded, the But when he had to note provided was available for the player's finger. perform, or perhaps was actually playing in a piece in which this particular interval was not used, he turned the ring partly round, and shut off the hole; thus a finger was free to be used elsewhere. It is clear that this ingenious piece of mechanism made the flute more useful for general purposes. The action anticipated that of the slider working in an organ soundboard. When the stop controlling this is drawn, the hole in the table of the wind-chest and that of the slider coincide; on the player putting down a key, the pallet is opened and wind passes up to the super-imposed pipe. Much the same plan was adopted in the Hydraulus organ of the Romans.

On consideration of what has been said, and a glance at the mounted Meroë flute fragments (or photograph) the conclusion come to must be that, thanks to the Liverpool University Institute of Archaeology, with congratulations to Professor Garstang on his successful exploration, we have obtained for England specimens of the exceedingly rare Bombyx flutes of the ancients.

This is not the occasion to enter into a description of the Greek scales system (modal we now term it) each of them with its individual succession of intervals; nor the development of the diatonic, chromatic, and enharmonic scales from the ancient pentatonic form. Nor to discourse on the employment of the tetrachordal method of building up a ladder of sounds in which the tonic appears in the middle of the scale, not at the bottom as with us; nor the intonation and treatment of the complex Pythagorean fourth, an interval subject to alteration. It is enough to observe that each of the Greek modes presented a character of its own incidental to the order of scalar intervals. According to the succession in which the notes were placed in their vocal music, so the design was to reproduce just those required, and no more, on the flute, when that popular instrument was used to play with and reinforce the voice. Various were the tone qualities and many were the names attached to the old Greek flutes. On sculptures and early illustrations will be noticed pipes having projections along the There is little doubt that these represented plugs placed in the finger-holes to stop-off notes not then needed; they could be taken out and readily replaced. It was a stroke of genius on the part of the Theban musician, circa B.C. 300, to invent the ring system and thus, as he boasted, to play on the same instrument music in the Lydian, Dorian and Phrygian modes. The rings running round the surface of the flute together with the little lug projections gave the instrument the appearance of a silkworm with its short legs; hence the designation βόμβυξ.

It will be asked, 'How were these flutes blown?' a question that cannot be absolutely determined. They could hardly be lip blown by the breath across the open top, as was the ancient Egyptian Nay—the diameter of the orifice appears too small for that method of sound production. The notes could have been evoked by the use of a vibrating reed put into the mouth end, or inserted sideways in the tube, as is seen in some sculptures. But there is another method of making them speak, viz., from a mouth-hole bored in the side, in fact, much as takes place now through the embouchure of the transverse flute.

It has been asserted that the side-blown flute is of comparatively modern invention, indeed that Germany of the sixteenth century is the place of its origin. Not so. On two of the splendid marble Topes in India are to be found representations of players with the side-blown flutes—vide Rawlinson's 'Tree and Serpent worship.' One of these monuments dates before Christ, the other early in the Christian era.

But we have still older evidence. Mr. Christopher Welch in his erudite and most valuable work on the flute tribe, The Recorder (1911, Froude), calls attention to an exhibit in the Room of Greek Roman Life at the British Museum. Here can be seen fragments, put together, of a flute found in a grave at Vistalik, Halicarnassus, by Sir Charles Newton during the time of the Crimean War. It is depicted and described at page 248 of Mr. Welch's book. The inner tube is of ivory with an outer casing of bronze; unfortunately little of the original remains. It seems to have been made in portions, either slid in over the ivory lining, or the sections socketed together. Impossible to say if the sections were movable the surface being throughout on one level, rings certainly could not slide up and down over the ivory; there is no indication of the convenient lugs. Towards the end is placed an ivory mouth-piece slightly raised above the body of the tube, and possessing a rounded hole by which the instrument was blown; the device and mode of playing is almost identical with to-day's transverse flute. The length of the instrument as now put together is twelve inches; its original length is uncertain.

On the shelf at the side of this Greek relic are two flutes in fair preservation, No. 522, from the Castellani Collection. They are of bronze and appear to have an ivory lining. Here again it may be noted they have been made in sections; whether any of these are independent portions intended to turn round and so operate on holes beneath cannot be determined owing to the encrusted condition of the instrument. There are no signs of lugs on the bronze covering. Each flute has five finger-holes; like the Halicarnassus example they have superimposed on the top a mouth-piece, here of bronze representing the head and bust of a reclining Maenad. The mouth-end of one tube is stopped, the other is broken and cannot be determined. They are labelled 'A Pair of Reed Pipes.' Although a small reed cut in its original matrix could be inserted in this hole, it is pretty certain that it could also serve as a direct mouth embouchure. However, in any case the pipe must have been held sideways to play.

Here then are preserved specimens of the  $\pi\lambda\alpha\gamma i\alpha\nu\lambda_0$ s family of flutes, a type often mentioned by the classical authors. Caspar Bartholinus in his elaborate and interesting work  $De\ Tibiis\ Veterum$  (Amsterdam, 1679) says that players on the plagiaulos 'modos vocis regebant,' indicating a method of governing the modes. He also states that the Bombyx was the longest of the flutes, quoting Aristotle and Pliny, who declare it was the most difficult to fill with breath, which would doubtless be correct if a reed was used. Quintilianus writing of this tibia speaks of the adjustable finger-holes 'Foramina alium clausis alium apertis.' Cicero alludes to the changing keys in 'Quam varios canendi modos.' Hesychius, a late Alexandrian writer, mentions the 'Pars tibiae quae ad os admovetur.' And Pollux declares they were played with 'arundinis foeminae specie.' Was this the single beating reed of the old Zammah, in distinction to the later double reed of the oboe type?

Mr. Welch in his book, p. 209, prints a passage in Greek from Arcadius quoted by Salmatius, Exer. Plin. 84, of some significance as to the adjusting of the movable metal encircling bands. The text is somewhat obscure, but it may be gathered that the closing rings could be slid round the surface; the employment of the word  $\sigma\tau\rho\dot{\epsilon}\phi o\nu\tau\epsilon$ s distinctly indicates that they could be turned round. These citations are suggestive. Whether the Meroë flutes were played from a side hole, and without a reed, cannot positively be determined. We might know better if we were certain as to the true length of the instrument; there is a limit to satisfactory note production in small tubes blown from a side embouchure. In all probability these flutes were reed blown.

The four flutes recovered from Pompeii, now reposing in the Museum at Naples, supply a measure of evidence worth consideration; it is apparent that their construction closely approximates to that of the Meroë examples. They have an inner tube of ivory with a bronze casing, and what is more important, they are furnished with the revolving rings, here believed to be of silver. If a reed had been inserted in the bulb-shaped mouth end, this, being a fragile tongue of wood, has perished in the long centuries while it lay after the eruption of Vesuvius. The length of these flutes is given as twenty-six inches; with their small bore (three-eighths) it would be very difficult to produce notes of any strength of tone. But with a reed, especially a double reed, it would be as easy as to play the teneroon—an old bassoon an octave above our bass orchestral instrument. The lowest note obtained would depend upon the stiffness and length of the reed employed in conjunction with the column of air set in vibration. If a reed was used, then the Meroë flutes would fall into the category of the oboe family. Pliny speaks of the instrument as possessing 'lingulas (i.e. tongues or speaking reeds) et foramina' (holes). There is a remarkable passage in Horace which perhaps affords some clue:—Ars Poetica, l. 202-5, 'Tibia non, ut nunc, orichalco vincta, tubaeque Aemula; sed tenuis simplexque foramine pauco Adspirare et adesse choris erat utilis.'—'The flute was not, as now, bound with (hard?) brass, and rivalling the trumpet; but being small and plain

was useful to blow with its few holes to assist the chorus.' This comment on the distinction between the old soft simple flute, and the (then) modern one bound with metal, striving to imitate the tone of a trumpet, is indeed significant. To some extent this stridency would result from the employment of a reed, and a considerable breath force. Well might the players need the use of a capistrum band to protect their cheeks from the internal breath pressure. After certain experiments with an arghool reed it was the settled opinion of Monsieur C. V. Mahillon, the well-known Belgian instrument maker, connected with the Brussels Music Museum, that a broad double reed was used with the Pompeian flutes; his conclusion has not been controverted. Incidentally it may be observed that, considering the great length of this set of instruments in the case of the one possessing fifteen finger-holes, and apparently furnished with five closing rings, owing to the distant spread of the holes, it must have been very difficult to reach and stop all when required to be closed by the fingers. In the Museum of the Capitol at Rome is a mosaic of the imperial period representing a tragic masque; the players have flutes like those found at Pompeii, seemingly furnished with double reeds. The mosaic was found in 1828 in the course of some excavations on the Mount Aveetin.

Corinth was the city where the best and most artistic flutes were made, but Alexandria ran it close for fame. No slight combinative skill was displayed in the planning, gauging the bores, and putting together the flutes; the ornamentation, inlaying, and finish of the instruments seems to have been as fine in its way as was the work of the Italian lute makers of the seventeenth century. There are many records of the high esteem in which these Greek productions were held, and of the enormous prices paid for them. If there were any good local Meroë players, as apart from the Greek immigrants invited to go to the luxurious city to exhibit their skill, it is very unlikely that they could obtain instruments of this advanced character; they would probably be content with their home manufacture. The visiting musicians were doubtless Greeks, the theorists of which land had perfected the older Egyptian musical system, and the craftsmen were skilled instrument makers; of course they brought their favourite flutes to the Upper Nile city.

The fragments of the five examples shown in the frame (Fig. 1) are placed together to make up an uniform length of about ten inches. What are believed to be their outlets, rounded conical slightly bell-shaped pieces, are put to the right.

No. 1 consists of five pieces. There is one large round hole in the second portion, and two smaller in the next; some of the ivory lining still remains attached. There are no holes in the next portion but a slight crack will be observed running along the top; this may indicate that the method of construction was to bend round and join up lengthways the pieces of the bronze covering.

No. 2. A similar break is seen in the first portion of this example. The reduction of diameter at the left end may indicate that it was intended for

a turning ring to be worked here. The next portion discloses in its middle the ivory lining intact; as it shows no finger-hole, it must be looked upon as a socket-joint to unite two portions of the flute. The conical outlet follows.

No. 3 consists of six pieces of much importance. On the surfaces of the first, second, third and fifth pieces will be seen inverted  $\Lambda$ -shaped protuberances. These are the lugs or ears fastened to the tops of the revolving rings; they form a sort of boss for the fingers to grasp and so turn easily when required to shut off a note not wanted; the closed dome-shaped

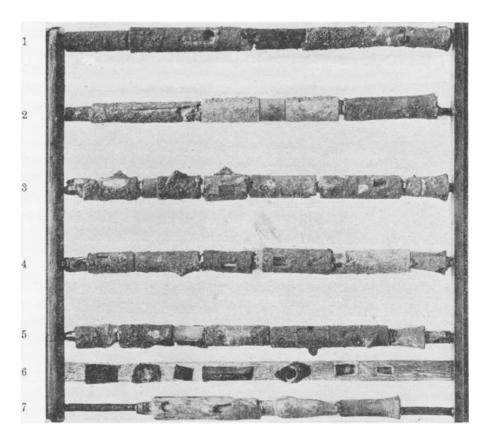


FIG. 1.—FRAGMENTS OF FLUTES FROM MEROË.

spring-keys on our wind instruments now serve an identical purpose. It may be mentioned that in certain of the brass instruments of Austrian bands circular valves are employed instead of pistons or sliders. It will be noticed that in this example some of the holes are rectangular, and that they differ in size, as do the round holes. The inference is that the Greek makers well recognized the necessity of true intonation, perceiving that on the precise size of the ventages depended the tonal accuracy of the notes produced. The larger the hole, the sharper or higher was the note; this method of graduation secured just intonation, on which the Greek theorists laid great stress. Holes in the first and fifth pieces remain open. The others are closed.

No. 4 consists of five pieces. On the first are found two lugs with rings, though not in line; the first has its squared hole uncovered. Then comes a joint followed by another larger hole that must have remained open always; beyond that is the second lug with its ring hole covered up. The next two portions exhibit squared holes open, they are of different sizes. Then is placed a piece with a portion of the ivory connecting joint still remaining.

No. 5 consists of five pieces. The first shews trace of a lug broken off. The next displays quite a long piece of its ivory lining. The third exhibits on its face two small round holes; perhaps the corresponding holes are in the ivory beneath, but the rings have got turned round and will no longer work, so these under-holes do not appear. The fourth and fifth portions now attached together have each a lug on them, one round hole in the bronze is in advance of this; running from it is a longitudinal crack. The ringed formation is here very clear, the respective round finger-holes remain open just opposite the lugs.

No. 7 consists of fragments of ivory only. If these ever possessed a bronze exterior it has disappeared; there is certainly a green metal stain on the socket of the first piece. Here is a round finger-hole, and then a remarkable ventage somewhat in the form of a comma stop (). If a guess may be made as to the purpose of this curiously shaped hole, it is that it was intended to serve a double purpose. If left entirely unclosed, it would yield a whole tone note; by graduating the surface covered (more easy to accomplish than with round or squared vents) a semitone or a smaller enharmonic interval could be obtained. The remarkable eleven-holed short reed-blown flute found in 1888 in the cemetery of Akhmin, the ancient Panopolis, was furnished with an ingenious method for obtaining this small interval, certainly used by the Egyptians long before the time of the Greek There is an enlightening passage in the old French writer civilization. Solomon de Caus (1614) as to skilled players covering the holes little by little:—'Peuvent les hauser ou baiser à leur plaisir par le moyen des doibs (sic) qui bouchent lesdits trous peu à peu.' It seems that this method of change of note, and 'justness' has obtained from time immemorial. To-day our players obtain small differences of intonation by the manipulation of their lips. Old hautboys had for use two small holes side by side, instead of one large one for use as required. The next piece on the rail is a piece of ivory neatly graduated to a curve; the outlet with some slight ring marks cut round it complete the examples on this rod.

On the lower cross rail of the frame (No. 6) are placed three fragments of the bronze, the incrustation partly filed off to shew the bronze surface. Then a piece of a smaller pipe with the jointure slit shewing; a broken little section of the flute disclosing its ivory lining; finally two fragments of the ivory, one stained green by the metal that had been above it, the other now cleaned.

It should be pointed out that the lugs have small pin-holes through the top. Was this to enable them to be fastened together by tying to a rod

running along, so that all the closing rings could be turned at the same time?

The little wooden frame on which the pieces are strung is deposited in the Museum of the Institute of Archaeology attached to the University of Liverpool.

There seems every probability that the flutes, which these relics represent, belonged to a Greek artist bringing with him for performance at Meroë his own improved and esteemed instruments. They are not likely to have been made locally.

The possession of these most interesting fragments from Meroë, recovered from the soil of the oldest of the civilizations, if it does not add a fresh full chapter to the historical account of the flute family, yet supplies valuable evidence of an important development in the descent of that delightful and most ancient instrument.

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Musical Instruments in Greek Worship Author(s): J. A. Haldane

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# MUSICAL INSTRUMENTS IN GREEK WORSHIP

By J. A. HALDANE

To learn that the Greeks knew of no equivalent to the special church music of today might cause some surprise. But, in fact, it was under the auspices of religion that their music in most of its branches was cultivated, its character being as manifold as that of the rites to which it was attached. The music associated with, for instance, the cult of Apollo was restrained, pacific, and harmonious, while the opposite character of turbulence and excitement typified that of Dionysiac worship. These were the classical and romantic strains of Greek music. Although the former approaches the more closely to our own idea of the liturgical style, the one was, to the Greeks, no more inherently sacred than the other.

The ethos of a particular piece of music depended to a considerable extent on the instrument used. The aulos, under which we might for the moment include the other wind instruments of the flute family, was recognized as being both socially and aesthetically inferior to the principal representative of the stringed group, the phorminx or kithara. It could command a simple ritual solemnity, could make a direct appeal to the strong basic emotions and arouse the martial instinct. Pythagoras, who considered its tone both blatant and vulgar, excluded it from the worship and recreation of his community, while Plato banned it from his ideal state because of its power to inflame politically dangerous passions.<sup>1</sup> There was also a period when, on account of its lugubrious character, it encountered opposition at Delphi, with the result that aulodic contests were temporarily suspended.<sup>2</sup> The kithara, on the other hand, was the instrument of the ἐλεύθερος. It was well suited to artistic worship and above all to the cult of Apollo. However, the many-stringed, polyphonal versions, such as the Asiatic pectis and magadis, were felt to exert a morally enervating influence. Timotheus in his Persae (219 ff.) tells how he was impeached by the Spartan magistrates for playing on an elevenstringed instrument at the Karneia.

Let us now turn to look more closely at the religious ceremony, beginning

<sup>&</sup>lt;sup>1</sup> Iambl. Vit. Pyth. 111; Plat. Rep. iii. 399 d.

<sup>&</sup>lt;sup>2</sup> Paus. x. 7. 5. See also H. W. Smyth, Greek Melic Poets (London, 1900), lxii.

with the procession or πομπή. While this might consist of no more than the progress of a few individuals to the altar at a private sacrifice, it might equally well take the form of an elaborate dance executed by a trained band of youths or maidens or of a magnificent civic pageant on the scale of the processions organized by the Catholic church in some European countries today. In all instances the traditional instrument was the aulos, which was played sometimes alone, although more often as an accompaniment to the raising of the paean-call or to the singing of the processional hymn (προσόδιον). A few examples might be given from comedy. In the mock-inauguration ceremony in the Birds at the point where the sacrificial procession is organized, the following instruction is given: ἴτω ἴτω δὲ Πυθιὰς βοὰ Θεῷ (i.e. the paean-call),/συναυλείτω δὲ Χαῖρις ἀδᾶ (857-8). The ἴακχος shout, accompanied by auloi, announces the procession of the μύσται in the Frogs (313 f.). In Menander's Dyskolos a sacrifice to Pan is represented and the aulos player is exhorted to play in his honour, 'for this is a god who must not be approached in silence' (432-4). With regard to actual cult, we learn from Pausanias (viii. 38.8) that worshippers advanced to the temple of Apollo at Megalopolis σύν αὐλῷ τε καὶ πομπῆ, and from the De Musica ascribed to Plutarch (1132 c) that the instrument was also used when the boy representing the purified Apollo was led back from Tempe at the Delphic festival of the Stepterion. More specialized rituals were the presentation of flowers by a maiden chorus to Hera Antheia at Argos to the melody of the aulos-played ἱεράκιον; the ἱερὸς γάμος ritual at Plataea where a number of puppets, one of which was dressed as a bride, were escorted to the top of Kithairon to the joyful music of auloi and the chanting of the hymeneal; and the dancing of armed youths towards an altar with aulos-music and paeans.2 It might be added that Proclus in his Chrestomatheia includes the characteristic of aulosaccompaniment in his definition of the prosodion, and that Pronomus and Klonas, who were composers of prosodia, were famous in the auletic tradition.3

Other instruments might, however, be added in accordance with the splendour of the occasion. For the procession of Zeus Sosipolis at Magnesia provision was made for an αὐλητής, συριστής, κιθαριστής (S.I.G.<sup>3</sup> 589, l. 46), and the same three instruments accompanied the Hyperboreans to Delos on a journey that was the prototype of the mainland

<sup>&</sup>lt;sup>1</sup> Euseb. Praep. Evang. iii. 1, p. 104 Dind. Cf. Ov. Amor. iii. 13. 11-12, and see L. R. Farnell, Cults of the Greek States (Oxford, 1896), i. 189 ff.

<sup>&</sup>lt;sup>2</sup> Cf. Xen. Anab. vi. 1. 11, Plat. Laws vii. 796 c.

<sup>&</sup>lt;sup>3</sup> Plut. De Mus. 1132 C, Paus. ix. 12. 6.

θεωρίαι to the island. The Dionysiac καταγωγία, when the god's image was borne through the midst of his rejoicing worshippers, was a blend of ceremonial pageantry with the noise and gaiety of a carnival. Choral hymns mingled their strains with revellers' improvisations and a variety of musical instruments vied with each other and with the Bacchic shouts of the excited crowds. Plutarch recounts how, during the triumphal progress of Alexander through Carmania in emulation of the god, the air resounded with the music of pipes, flutes, and harps.<sup>2</sup> His description of Antony's entry into Ephesus in the role of the New Dionysus is similar: 'Thus, when he was entering Ephesus, women dressed like Bacchanals and men and boys equipped like satyrs led the way; and the city was filled with ivy and thyrsi and psalteries and pipes and flutes, the people hailing him as Dionysus, Giver of Joy and Beneficent' (Ant. 24).3 We learn further that the ostentatious Dionysiac procession of Ptolemy Philadelphus at Alexandria included a massed choir of six hundred men and a party of three hundred kitharists.4

Occasionally in Apolline worship the kithara only was used. In the third Homeric hymn (515) it is played by the god himself when he leads the Cretans with dance-steps to the Delphic temple. That the rite represented here survived (or, more probably, was revived) as late as the second century B.C. would appear from the inscription at the head of the prosodiacal paean of Limenius, discovered some seventy years ago at Delphi, recording that the hymn was accompanied by the poet himself on the kithara. Heliodorus, in a picturesque passage (Aeth. iii. 1 f.), describes a visit to the Delphic shrine by a Thessalian θεωρία which included a chorus of maidens, some of whom danced, carrying baskets of conserves and spices on their heads, while others, who bore baskets of fruit and flowers, sang a hymn to the music of kitharai. While it is improbable that the ceremony described was based on the actual ritual of Neoptolemus, to whom Heliodorus assigns it, it was doubtless inspired by some more familiar scene at the Delphic temple. Naturally the kithara, lacking the stronger tones of the aulos, would by itself have formed insufficient support for the heavier type of procession. It was, however, eminently suited for the graceful advance of a group of dancers.

Several works of art support the evidence of literature. One side of the Hagia Triada sarcophagus shows a sacrificial bull followed by an aulete, and the instrument is likewise played in the rear of a procession

<sup>&</sup>lt;sup>1</sup> Plut. De Mus. 1136 A, Farnell, op. cit. iv. 100 ff. 2 Alex. 67.

<sup>&</sup>lt;sup>3</sup> The translations are those of the Loeb edition with slight alterations.

<sup>4</sup> Ath. v. 201 ff.

at a bull-sacrifice to Athene depicted on a black-figured vase from Boeotia.<sup>1</sup> On the other hand, four *kithara* players as well as four *aulos* players appear on the representation of the Panathenaic procession on the north side of the Parthenon frieze. There are, in addition, several vases and fragments on which both instruments are shown, although it is noteworthy that on these the aulete is generally in the precedent position.<sup>2</sup> The instrumentalists are usually last in the order of the procession.

We now take up our stand with the worshippers around the altar. An instrument employed during the preliminary stages of the sacrifice, less for its musical properties than to regulate the proceedings, was the trumpet. Each blast from it signified that a further animal was to be brought forward for slaughter.<sup>3</sup> It was also used to command silence from the crowd for the prayers spoken by the herald.

During the rites of libation, incense-burning, and sacrifice, it was again the *aulos* which was played. With the pouring of libations the paean call was also raised. Hence the *aulos*-accompanied paean customarily sung at the opening of the formal symposium. There is an excellent illustration of the ritual of incense-burning on the Ludovisi Throne, one side of which shows a woman who, with covered head, scatters incense on a θυμιατήριον, and the other a maiden playing the *aulos*. In a similar scene from the Eleusinian festival depicted on the Ninnion tablet choral dances are included. The playing of the *aulos* during the burning of the sacrifice was all but obligatory, so much so that exceptions, such as were found in chthonic ritual, merited particular notice. Herodotus records its absence as one of the distinguishing features of the Persian sacrifices.<sup>4</sup> The instrument is also conventionally represented on sacrificial scenes on black-figured vases.<sup>5</sup>

It has been suggested that the *aulos* was employed in such primary acts of devotion because its music was felt to have an apotropaic power. That may well have been so, although the reason why the *aulos* in particular should have been adopted in preference to the *kithara* was doubtless fundamentally the practical one that it was the instrument of the people and could be played without much training or skill—and Greek religion

<sup>&</sup>lt;sup>1</sup> See E. Pfuhl, Malerei u. Zeichnung der Griechen (Munich, 1923), iii, pl. xxxix. 170.

<sup>&</sup>lt;sup>2</sup> See S. Eitrem, Beiträge zur griechischen Religionsgeschichte (Christiania, 1920), iii. 94. To the evidence cited by Eitrem might be added that of several red- and blackfigured vase fragments from Menidi discussed in Arch. Jahrb. xiv (1899), 104 ff.

<sup>&</sup>lt;sup>3</sup> See L. Ziehen, Hermes lxvi (1931), 231 ff.

<sup>&</sup>lt;sup>4</sup> 1. 132. 1.

<sup>&</sup>lt;sup>5</sup> See, for instance, in the British Museum Catalogue of Greek and Etruscan Vases, nos. B. 79, B. 627, E. 504a. The kitharode on the Hagia Triada sarcophagus is exceptional.

was essentially democratic. However, especially when dance and song formed part of the ceremony, the kithara was added. Thus, in another of the hymns found at Delphi, the singers describe the shrill tones of the aulos mingling with the sweet tones of the kithara while the thighs of bulls burn on the altar. Lucian in his De Saltatione (ch. xvi) mentions a familiar Delian ritual at which, while the sacrifice was blazing, choruses of children came forward and danced in the hyporchematic style to the accompaniment of both instruments. In such instances the aulos must have tended to drop into the background, with the result that Proclus, with his grammarian's passion for tidy classification, can define the altar hymn as performed πρὸς κιθάραν.

But in fact, even as a generalization, Proclus' definition will scarcely suffice. When we consider the altar hymn in more detail, including under that heading the singing both during the sacrifice (in which the presence of the *aulos* can always be assumed even if not specifically mentioned) and afterwards as part of the continuing festivities, we find that the principal instrument was to a large extent determined either by the deity addressed or by the spirit of the ritual.

The aulos maintained the lead notably in Dionysiac worship. A special type, the χορικὸς αὐλός, was developed for use in the dithyramb by a single player who stood upon the altar round which the dancers whirled. Choregic inscriptions recording the names of victorious tribes in the Athenian competitions provide an interesting commentary on the growing importance of the flautist's role. Whereas his name makes no appearance at all before the fourth century, it has a hundred years later taken precedence over that of the poet. Another popular Dionysiac song was the ἐπιλήνιον performed around the wine-press at rustic festivals to the spirited melody referred to by Pollux as the ἐπιλήνιον αὔλημα.

The warlike tone which the *aulos* could convey made it the natural instrument in ceremonies of a martial character. We have already noticed its use with a processional type of *pyrrhiche*. At Sparta, the war-dance was cultivated as a hyporcheme from the time of Thaletas. Polykrates is in all probability referring to this type of performance when he says of the *Hyacinthia*:

'Others march through the theatre on gaily adorned horses; full choirs of young men enter and sing some of their national songs, while dancers mingling among them go through the figures in the ancient style, accompanied by the flute and the voice of the singers' (Ath. iv. 139 e). Both the pyrrhiche and the aulos are connected in mythology with Athene,

<sup>&</sup>lt;sup>1</sup> See also the Hymn of the Curetes (Collectanea Alexandrina, ed. J. U. Powell [Oxford, 1925] 160), which was probably also written for performance at a sacrifice.

as an explanation of their predominance in her cult. Pindar ascribes to her the invention of the *aulos*<sup>1</sup> and we are told that she played it for the war-dance of the Dioscuri,<sup>2</sup>

Examples for the use of the kithara are derived overwhelmingly from the cult of Apollo under whose patronage χορεία—embracing the triple elements of music, dance, and song—was cultivated as a fine art, reaching its apogee at the time of Pindar. The earliest literary mention of music in ritual is the account in the first book of the Iliad (472-4) of the paeans performed to the kithara by the Achaean youths in order to propitiate the god after the plague. A similar instance in later poetry is the dancing of the Argonauts about the altar of Apollo to the hymn and music of Orpheus.<sup>3</sup> The kithara resounds to the paeans of youths during the springtime celebrations round the god's altar at Megara described by Theognis (777-9), and to quote again from Polykrates' account of the Hyacinthia:

'Boys with tunics girded high play the lyre or sing to flute accompaniment while they run the entire gamut of the strings with the plectrum; they sing the praises of the god in anapaestic rhythm and in a high pitch.'

Alcaeus (Fr. 1) described the epiphany of Apollo at Delphi, when choruses of youths sang a paean to welcome the god back from the land of the Hyperboreans and the kithara 'puts on a summer wantonness concerning the god'. In his second hymn, Callimachus, with Delos in mind, presents in dramatic form an almost exactly parallel ritual. In the role of chorus-leader he exhorts and applauds, 'Let not the youths keep silent lyre or soundless step when Phoebus visits his temple, if they wish to accomplish marriage and cut hoary locks . . . . Well done, the youths, for that the tortoise-shell is no longer idle.'

It was common in these instances for the kitharist to lead the chorus through the figures of the dance, or at least to participate in it. So Sophocles with the kithara led the choir of naked youths who performed paeans around the trophy erected after Salamis; and in the third Homeric hymn (201 ff.) Apollo, in the role of musician, sports amongst the Olympians in the high-stepping dance characteristic of his cult. A similar trait appears in the famous 'crane' dance executed by torchlight around the image of Ariadne–Aphrodite on Delos. The prototype of the scene is colourfully described by Callimachus and likewise the François Vase portrays the chorus of seven youths and seven maidens,

<sup>&</sup>lt;sup>1</sup> Pyth. xii. 7.
<sup>2</sup> Schol. Pind. Pyth. ii. 127.
<sup>3</sup> Ap. Rhod. Arg. ii. 701 ff.
<sup>4</sup> Ath. i. 20 e-f, Vit. Soph. 3.

<sup>&</sup>lt;sup>5</sup> H. iv. 304 ff. For this dance see further L. Séchan, La danse grecque antique (Paris 1930), pp. 119 ff. and K. Latte, De saltationibus Graecorum, RGVV xiii (1913), 68 ff.

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led by Theseus with his lyre, who were supposed to have instituted the dance after their escape from the Cretan labyrinth.

In the cult of Artemis also the *kithara* was a familiar instrument, as witness her Spartan epithet χελύτις and the characterization of her in one of the Homeric hymns as rejoicing in φόρμιγγές τε χοροί τε (v. 19). At Ephesus, where Oriental influence was evident in her worship, we hear of the *magadis* and similar instruments in the hands of her resident choir, the Lydian maidens. Diogenes says:

'And I hear that the Lydian and Bactrian maidens dwelling beside the Halys river worship the goddess of Tmolus, Artemis, in her laurelshaded grove, while amidst the plucking of triangles and *pectides* they thrum the *magadis* in responsive twanging, and where also the flute, in Persian fashion, joins its welcome concord to the chorus.' Castanets (*krembala*) are also mentioned.<sup>2</sup>

Before passing on to the less familiar instruments, it will be worth while to glance at the use of aulos and kithara in the παρθένειον, or maidens' dance-hymn, in general. Naturally this was cultivated especially in the cults of the female deities. We have already seen the aulos in the processional form at Argos, but it is clear that in the round dance either instrument could be employed. Mention is made in Athenaeus (xiv. 634 f.) of a special παρθένιος αὐλός, although Aleman mentions both flute and kithara.<sup>3</sup> On an Attic hydria in Naples<sup>4</sup> there is an interesting representation of a group of maidens, probably engaged in some ritual, with καλαθίσκοι on their heads and in the concluding postures of a dance, while the musician who stands before them lays down an aulos and takes up a kithara. The choice of instrument was no doubt determined largely by the character of the performance. The aulos would accompany the livelier, more boisterous type of dance while the kithara would be preferred especially in those cases when the song was the more important element. Only rarely do both instruments appear to have been used together. A red-figured Attic λεκάνη<sup>5</sup> showing five maidens dancing round an altar on which a flute-player sits and a kitharist stands is one of the few examples. Another, the Dali patera from Idalion,6 on which women dance before a deity with flutes, lyres, and drums, reveals Oriental influence.

Passing on to the syrinx, we have found that it was sometimes used to support the other instruments at a civic festival. Occasionally also,

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<sup>1</sup> Ap. Ath. xi. 636 a = T.G.F.^2 p. 777.
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<sup>&</sup>lt;sup>2</sup> Dicaearchus ap. Ath. xi. 636 d. <sup>3</sup> Frr. 66 and 78 (Bergk).

<sup>&</sup>lt;sup>4</sup> See Furtwängler-Reichhold, Griechische Vasenmalerei (Munich, 1932), iii. 171.

<sup>&</sup>lt;sup>5</sup> See L. Stephani, Compte-rendu (St. Petersburg, 1869), pl. iv. 14.

<sup>&</sup>lt;sup>6</sup> See F. Winter, Kunstgeschichte in Bildern (Leipzig), i, p. 104, no. 3.

it replaced the more common aulos, as when it accompanied the wardance performed by the armed priestesses of Artemis at Ephesus.<sup>1</sup> But its most characteristic place was in pastoral worship. It was the instrument of Pan, the Nymphs, and Hermes, with whom it is consistently represented in art. The best illustration is provided by the Nymph reliefs, on a number of which Hermes leads the Nymphs in a dance to the piping of Pan. The frolicking of Pan and his train to the music of the syrinx was also a stock topic in literature. The Homeric hymn to the god gracefully recounts, how, when he returns piping from the chase, 'with him go the clear-voiced mountain nymphs and with nimble feet dance and sing by the dark spring. The echo resounds over the mountain top. The god glides now to one side, now to the other in the dance, and now to the centre, and foots it with many a step . . . the nymphs sing of the blessed gods and high Olympus.' For an account of an actual scene of worship we have to turn to Longus who, in a late and sophisticated style but certainly relying on tradition where ritual is concerned, describes a sacrifice to Pan with hymns accompanied by the syrinx (Past. ii. 31). Mythology ascribed the invention of the syrinx to Hermes, together with that of the lyra, the humbler, domestic version of the kithara.<sup>2</sup> Instrumentalists appear on vase paintings, in which worshippers in festive garments are shown grouped around the Hermes term.3

Another form of reed-pipe, and a cruder instrument than the *aulos*, was the *kalamos*. Since the flat sea-marshes provided the most copious stock of material for its manufacture, it not surprisingly found a place in the worship of Poseidon. To be contrasted with the decorous welcome of Apollo at Delphi and Delos are the boisterous crowds who saluted the sea-god on his epiphany at the Isthmus σὺν καλάμοιο βοặ (Pind. *Nem.* v. 38).

Orgiastic worship possessed its own outlandish miscellany of musical instruments. Among these were the bass aulos, the horn, and a range of percussion instruments such as tympana (kettle-drums), kumbala, krembala, krotala (rattles), and the rhombos (bull-roarer). In the parodos of the Bacchae the singers recall their leader's exhortation to his thiasos, 'On ye Bacchae, on ye Bacchae, the glory of goldenflowing Tmolus, hymn Dionysus with loud-roaring kettle-drums, exalting the god of the Evoe in his own true fashion with Phrygian cries and shouts, when the sacred flute of melodious sound pours forth sacred and sportive music and you hasten to the mountains, to the mountains.' Dancing maenads on vase-paintings are regularly attended

<sup>&</sup>lt;sup>1</sup> Call. H. iii. 237 ff. <sup>2</sup> Hom. h. iv. 39 ff., 512.

<sup>&</sup>lt;sup>3</sup> See E. Gerhard, Über Hermenbilder (Berlin, 1868), pl. 64. 1, 65. 2.

by the same instruments. The Mother of the gods, who in the fifth century was fused with the Phrygian Cybele, is said in the Homeric hymn in her honour (xiv) to rejoice in the din of rattles and kettledrums and the stridor of flutes while she drives on the mountains in a chariot yoked with wolves, leopards, and lions. Bull-roarers and cymbals are added to the list by Diogenes in describing her worship in Asia Minor.<sup>2</sup> The syrinx was eventually imported as the instrument of her satellite Attis, who had a pastoral function. A clue as to the purpose of such music is offered by Aeschylus in a fragment from the Edones which paints a hair-raising picture of the rites of the Thracian Cotytto: 'one holding in his hand the bombykes (reed-flutes), toilsome work of the turner's chisel, fills full the fingered melody, the call that brings on frenzy (μανίας ἐπαγωγὸν ὁμοκλάν), while another causes to resound the bronze-bound kotulai (cymbals); stringed instruments raise their shrill cry, and frightful mimickers bellow like bulls from some place unseen, and the echo of drums, like subterranean thunder, rolls along a terrifying sound'.3

It was the *stridor* that induced the *mania*, in which the worshipper stood outside himself, lifted above the plane of everyday existence. And with ecstasy came the illusion of power. 'If a man can with cymbals induce a god to do whatever he wishes, that man is greater than a god', is the sage comment of Menander.<sup>4</sup>

The occasions were rare on which music was absent from Greek ritual. Remove the flute, says Plutarch, and worship becomes a dismal affair, lacking the true festival spirit. As remarked above, it was chiefly in the cult of the chthonioi that a rule of silence might be imposed. Apollodorus mentions that the aulos was proscribed when sacrifice was made to the Charites at Paros where the goddesses retained their original character as powers of the earth and fertility, far removed from that which resulted from the more literal interpretation of their euphemistic name. Similarly, offerings were brought to the dread Zeus Lykaios ἐν ἀπορρήτω (Paus. viii. 38. 7). But silence was by no means always observed. At the end of the Eumenides—if it is permissible to cite here an example from drama—the Semnai are installed with choral song and the raising of the joyful ὀλολυγή. We hear too of aulos and kithara in the Demeter and Persephone mysteries where their music complemented the choral

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    Cf. Eur. Hel. 1301 ff., 1346 ff.
    Ap. Ath. loc. cit. = T.G.F. p. 776.
    Ap. Strab. x, p. 470 (= Fr. 57), as restored and translated by H. L. Jones.
    C.G.F. 245 K.
    Non posse suav. vivi sec. Epic. 1102 A.
    Bibl. iii. 15. 7.
    S.I.G.<sup>3</sup> 736, ll. 70 ff. (Andania).
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MUSICAL INSTRUMENTS IN GREEK WORSHIP 107 ritual of dance and song through which the story of Persephone was unfolded.

Music in Greek religion had a double function to fulfil. On the one hand it served a practical purpose; it soothed the god with its mellifluous cadences and so disposed him to look with favour upon the requests of his worshippers. On the other hand it provided a means of spiritual relaxation and also, in the best period, of spiritual refinement.

#### NAEVIUS' AUTEPITAPH

Immortales mortales si foret fas flere flerent divae Camenae Naevium poetam; itaque postquam est Orci traditus thesauro obliti sunt Romai loquier lingua Latina.

Immortal tears, might they but fall for us men mortal,
The blessed Muse herself might Naevius mourn, the maker;
Now is he handed down where Death stores up his treasure;
And in Rome the good old Latin tongue is clean forgotten.

E. S. G. ROBINSON



 $\label{eq:local_continuity} Instrumental \ Music in the Roman \ Age \\ Author(s): \ H. \ J. \ W. \ Tillyard$ 

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#### INSTRUMENTAL MUSIC IN THE ROMAN AGE.<sup>1</sup>

THE cultivation of instrumental music remained in a backward state among the Greeks in the fifth and fourth centuries, B.C. This was certainly not due to any want of taste for music as a whole, for no race ever valued it higher than did the Greeks. The reasons seem to have been, first, the bondage of the instrument to the voice, second, the unsettled state of the musical scale, and thirdly, the dislike of the Greeks for over-elaboration in music.

These three points are well illustrated in the Republic of Plato. In opening the discussion on the admissibility of certain modes, Socrates is made to say that a musical composition is made up of three things, the 'words,' the 'harmony,' and the 'rhythm,' and that the musical 'words' are in themselves in no way different from the words of common speech.<sup>2</sup> In another place much scorn is cast by Glaucon on the musicians that sought for the least perceptible interval to make that the unit of sound-measurement, some of the experimenters declaring that they could distinguish an intermediate note, where others insisted that the two sounds had passed into unison.<sup>3</sup> Socrates answers 'You mean those gentlemen who tease and torture the strings, screwing them up on the pegs.'

Socrates and Glaucon both speak as amateurs in music, and their feelings must have been shared by many Athenians at the time. Just as with us there are some who long for the return of Handel's 'noble harmonies,' as a relief from the chromatic aberrations of the Wagnerian school, so these two worthy Greeks looked back to the sturdy Dorian airs of Terpander as the true strains of the Hellenic muse, before she had learnt to voice the subtler moods of the heart of man. To such amateurs the refinements of the musical scale must have seemed base loans from the decadent

I wish to thank the following gentlemen for their kind and valued help to me in collecting the materials for this article: M. A. Merlin, Head of the Department of Antiquities for Tunisia, for having specially had photographed for me the unpublished statuette from the Musée Alaoui, Tunis (Fig. 5) as well as for much other assistance; M. Gouvet, Director of the Museum at Susa (Sousse) for the prints used in Figures 2 and

<sup>4;</sup> and Dr. W. H. D. Rouse for supplying me with a modern example of a pan-pipe from Smyrna.

With very few exceptions, the monuments referred to are known to me in the originals, from my visits to the museums where they are to be found.

<sup>&</sup>lt;sup>2</sup> iii. 398 D. Cf. Nettleship, Lectures on Plato's Rep. 108.

<sup>&</sup>lt;sup>3</sup> vii. 531 A.

art of the East; and if, as is now thought, the music of the fourth century used intervals of a quarter, three-eighths, a third, two-thirds, and three-quarters of a tone, this was no wonder.<sup>4</sup>

The contrast is drawn by Socrates between the school to which Aristoxenus belonged, the cultivators of the enharmonic style, and the Pythagoreans, who based the scale on the harmonic relations of the octave, fourth, and fifth. Into the details of this controversy there is no need to enter, but it is clear that such a simple and easily-tuned instrument as the lyre was best fitted to this screwing-up process by which the minimum intervals were reached. A many-stringed instrument would have taken too long to adjust to any highly complicated system. By the time of Aristoxenus himself the enharmonic scale was nearly dead, as Aristoxenus himself regrets; <sup>5</sup> and although the later musical writers repeat mechanically their account of it, there is not much reason for thinking that it was ever revived in practice. Aristoxenus complains that, if the enharmonic system was dropped, there would soon be nothing left but the diatonic and the 'highstrung' chromatic ( $\chi \rho \hat{\omega} \mu a$  $\sigma \hat{\nu} \nu \tau \sigma \nu \rho \nu \sigma \hat{\nu}$  and these actually survived.

The objection felt by many Greeks to variety of musical effect is voiced by Socrates soon after his remark first quoted. He banishes such many-stringed and various instruments as the 'Triangle,' the 'Pectis,' and all kinds of flutes,' leaving only the lyre, cithara, and, for shepherds, the pan-pipe (syrinx). It is possible that in retaining the cithara, Socrates may have meant only the kind with few strings, for it would have been strange to admit a fourteen-stringed cithara, while condemning the flute for its too great variety of sound. Here Plato's views must have seemed very narrow even to his own age. In making music a means of moral upbuilding he not only struck at virtuosity and over-refinement, but would have checked the progress of the art along its most promising lines. His beliefs do not seem to have had much effect, for the very instruments that he excluded were cultivated with growing zeal. In Greece itself however the double-flute, lyre, and cithara remained the favourites. At Athens every boy was taught the lyre, and

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<sup>&</sup>lt;sup>4</sup> Cf. Westphal, Harm. u. Mel. d. Gr. 45-47. Westphal's view holds the field, but it needs some faith to believe that these ear-splitting dissonances were commonly played and sung. The so-called enharmonic mode of the modern Eastern Church (\*Hχος τρίτος; cf. I. Th. Sakellarides 'Ιερὰ 'Υμνφδία 95) is sung like the major scale of F; and it has been supposed by Dom Gaisser (La Musique Eccl. Gr. d' après la Tradition) that the ancient enharmonic was in practice the same as this, the two quartertones being always sung together, and the double tone being divided. It is impossible now to go into this interesting theory.

<sup>&</sup>lt;sup>5</sup> Quoted in Plut. de Mus. 38. Cf. Aristox. Harm. i. 23.

<sup>&</sup>lt;sup>6</sup> This is stated by Ptolemy. Cf. Monro, Modes of Ancient Gr. Mus. 111. The highstrung

chromatic could be played on a piano; and although Ptolemy has three kinds of diatonic scale, it would still seem that the music of his day would not have sounded utterly barbarous to our ears. A form of chromatic mode is in use in the Eastern Church, and is often heard in Romaic folk-songs: it has an austere and striking effect. A 'soft' diatonic is sung in some Greek churches as the second Byzantine mode; but few western listeners find much sweetness in it. We ourselves allow both the 'just' and the 'tempered' intonation; the bagpipes, I believe, are tuned to neither of these, and their effect is not always disliked.

<sup>&</sup>lt;sup>7</sup> iii. 399 c and D. Arist. *Pol.* viii. 6 will not allow these instruments in the training of the young.

the use of the flute was by no means confined to professionals: Alcibiades, for example, is said to have studied on it. Again Epaminondas not only played the flute like other Thebans, but learnt the lyre also. The cithara, which had been perfected by Timotheus, was chiefly played by professionals. These three instruments are common subjects on Attic vases, and late monuments and authorities show that their use went on through the Roman age: their nature however is so well known that there is no need to say more about them.

The kinds of harp called 'Triangle' and 'Pectis' by Plato seem to have been of Lydian origin. Athenaeus, who has a long discussion on the subject, says that the Magadis was a stringed instrument, later called Sambuca, while the Pectis was the same. It is possible that the 'Triangle' was also similar, and that the names of Trigonon and Pectis were meant as Greek renderings for the foreign words Magadis and Sambuca. This harp, as it may safely be called, is often seen in Egyptian art, and must have been widespread over the East. It appears on a fine red-figured vase in conjunction with the lyre and

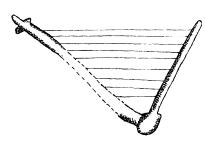


FIG. 1.—TRIGONUM OR SAMBUCA.

cithara.<sup>11</sup> Athenaeus says that Sappho brought in its use from Lydia, and Anacreon, as his own words record, played a harp with twenty strings.<sup>12</sup> The instrument embraced the whole compass of the singing voice, and had high notes beyond the range of the cithara.<sup>13</sup> It could be used without a striker. One of its peculiarities was that the sound-box was on the upper side. Smaller sizes with nine or even five strings

were sometimes made. Examples of such miniature harps are seen in some of the wall-paintings now in the Naples Museum: one of these, played by a Cupid, is here illustrated. (Fig. 1)<sup>14</sup>

Another stringed instrument of the same class, more like a zither, became popular in the Roman Age. But, while the use of the harp called for great skill, and gave full scope for rich and splendid effects, the zither can only have yielded a thin and twanging tone, especially as the ancient instrument often had no sound-box. This instrument is nearly always played by women, who often wear a carelessly sumptuous dress, suited rather to paid performers than to freewomen. Examples are again seen in Roman wall-paintings. In

 $<sup>^{8}</sup>$  Duris ap. Athen. iv. 84, 184 p, where it is said that the famous flute-player Pronomus was Alcibiades' master.

<sup>&</sup>lt;sup>9</sup> Cf. Paus. iii. 12. 8.

<sup>10</sup> Athenaeus xiv. 34-38. Aristotle l.c. classes together the Pectis, Barbiton, Heptagon (otherwise unknown), Triangle, and Sambuca: he calls them ἀρχαῖα ὅργανα.

<sup>&</sup>lt;sup>11</sup> Baumeister, Denkmäler, 1544.

<sup>12</sup> Anaer. 14(5). ψάλλω δ' εἰκοσ( $l\chi$ ορδον)  $< \dot{\epsilon}\nu \chi$ ερσ $l\nu > μάγαδιν ἔχων. In fr.13(16) he$ 

speaks of the Pectis.

<sup>&</sup>lt;sup>13</sup> Telestes 4 (5) (Bergk) τολ δ' ὀξυφώνοις πηκτίδων ψαλμο $\hat{i} < s > κρέκον$  Λύδιον  $\mathring{u}$ μνον.

<sup>14</sup> For other examples cf. Le Pitture Ant. d' Ercolano. v. 167. Inghirami, Pitt. di Vasi Fittili iv. cccxliii., and von Jan Arch. Zeit. xvi. 187 (Pl. cxv. 14). For these instruments in general cf. an article by von Jan in Baumeister s.v. Saiteninstrumenten; and a dissertation of the same writer, Die gr. Saiteninstrumenten.

Roman Africa a complicated form of this instrument was common, and it is often represented in statuettes. The example (Fig. 2) is from Susa (Hadrumetum) and shows a lady performer, richly dressed, and possibly wearing

a wig: on either side of her is a small figure, perhaps of a muse. The type is often seen in Africa. The name of this zither was perhaps the Psaltery.

A more curious contrivance was the so-called Tripod, invented by Pythagoras of Zacynthus, and described by Athenaeus.<sup>16</sup> This stood on a revolving base with a soundbox called  $\lambda \epsilon \beta \eta_S$  above; the strings were stretched between the three branches that gave the instrument its name. On one side the strings were tuned in the Dorian mode, on another in the Phrygian, and on the third in the Lydian. If the player wished to change the mode, he had only to turn the instrument with his foot, so as to bring another row of strings within his reach. The left hand was used to stop down the strings or to check their vibration, 17 and the right hand held the striker. This ingenious instrument did not survive the death of its inventor.

The principle of shortening a string to make higher notes was known to the Greeks at an early age. Nicomachus says that the



FIG. 2.—TERRACOTTA FIGURE AT SUSA. WOMAN WITH ZITHER (PSALTERIUM).

Pythagoreans called a one-stringed lute a Canon,<sup>18</sup> which means that it was used by them as a standard for generating their scale. It is quite possible that the range of the cithara was sometimes extended by stopping down the strings, but this was no part of the regular technique of that instrument. In the Roman age instruments appear in which the strings were systematically stopped down on a finger-board as in a modern mandoline. Although it is possible to embrace a large compass of notes in this way, the tone produced must always have been feeble and lacking in resonance; and as now the guitar, mandoline, and banjo are hardly reckoned as instruments of music, so the use of such instruments in old time was a sign of declining taste. The ancient name seems to have been the Pandura. Pollux remarks that the Pandura had three strings, and was invented by the Assyrians.<sup>19</sup> Nicomachus, in the place already quoted, classes the Pandura with the one-

<sup>15</sup> Cf. two similar figures in the Musée Alaoui, Tunis (Musée du Bardo 74, 75; in the series Musées et Collections arch. d'Algérie et de la Tunisie, ed. La Blanchère.)

<sup>16</sup> Athen. xiv. 41.

 $<sup>^{17}</sup>$  Διὰ τὴν ἐπιβολήν.

<sup>&</sup>lt;sup>18</sup> *Harm.* p. 8.

<sup>19</sup> Pollux iv. 60. τρίχορδον δὲ ὅπερ ᾿Ασσύριοι πανδοῦραν ἀνόμαζον, ἐκείνων δ᾽ ἢν τὸ εὕρημα. Where however Dindorf notes that no form of the name Pandura is found either in Assyrian or Chaldaean.

stringed lute. But this can hardly mean more than that the notes were produced on the same principle, namely by stopping down the strings. Other writers confuse the Pandura with the pan-pipe; <sup>20</sup> but as the name is still applied to a stringed instrument in Italy, it can hardly have been otherwise in antiquity. Martianus Capella <sup>21</sup> calls it an Egyptian invention, and it is probable at any rate that it came from the East. The Emperor Heliogabalus, who was brought up in Syria, used, among his other undignified pursuits, to play on the Pandura; <sup>22</sup> and one is represented on a silver cup of Graeco-Persian workmanship found in South Russia. <sup>23</sup>

About a dozen examples of this type of instrument are known, and none of them is earlier than the Roman age.<sup>24</sup> Two principal shapes may be distinguished. One is shaped very much like a mandoline, with an oval shell and a short neck. Of this the Graeco-Persian Pandura is a

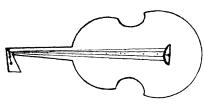


FIG. 3.—PANDURA.

specimen; and there is another played by a siren on a sarcophagus in the Lateran Museum, <sup>25</sup> and another, almost guitar-shaped, in the museum at Turin (Fig. 3). <sup>25a</sup> The other form resembles a banjo: it has a very long neck, but instead of a drum head stretched over a hoop, a round shell is used

to re-inforce the sound. The back and front of such instruments, with the manner of playing, are shown in the illustrations (Figs. 4 and 5). These are taken from African statuettes; but the type is not at all common. The other extant examples are chiefly on sarcophagi. A fine specimen is seen in the representation of the wedding of Cupid and Psyche on a late sarcophagus in the British Museum.<sup>26</sup> At Naples <sup>27</sup> there is a sarcophagus which is remarkable because not only one of the figures in the scene represented, but also the lady who appears on the medallion, and was therefore buried in the coffin, are playing the Pandura. The instruments here are shaped like the African specimens, having a crescent-shaped top, and four strings instead of the three mentioned by Pollux. It cannot be seen whether the finger-board was divided by ridges, as in modern instruments of that class. On the African statuette it would almost seem that the strings are stretched over a bridge, but this also is uncertain.

Among the instruments condemned by Plato are all kinds of flutes.28

<sup>&</sup>lt;sup>20</sup> E.g. Isid. Orig. 3, 20.

<sup>&</sup>lt;sup>21</sup> 9. 924. Athenaeus iv. 82 ascribes its discovery to the Troglodytes by the Red Sea.

<sup>&</sup>lt;sup>22</sup> 'Pandurizavit,' Lamprid. Hel. 32.

<sup>23</sup> Stephani, Compte Rendu, 1881, 55.

of his examples are doubtful. The supposed Pandura on the well-known Hippolytus relief on a fine early sarcophagus in the cathedral at Girgenti (Arch. Zeit. 1847, Pl. VI.) seems to me (after close inspection) to be only an elongated lyre. The instrument on a relief in

the Louvre (Clarac, Mus. Sculp. 119, No. 47; cf. Robert, Ant. Sark. ii. 41, pl. 26 A) is also hardly a Pandura.

<sup>&</sup>lt;sup>25</sup> Benndorf, 126.

<sup>&</sup>lt;sup>25a</sup> On a late relief of Orpheus and the Nymphs. Unpublished, but possibly forged.

<sup>&</sup>lt;sup>26</sup> Ancient Marbles in B.M. Pl. IX. Fig. 3, and p. 35.

<sup>&</sup>lt;sup>27</sup> Naples Museum, No. 6598.

<sup>&</sup>lt;sup>28</sup> Arist. *l.c.* also rejects the flute in education.

He was no doubt thinking chiefly of the double-flute, which had reached a high pitch of complication in his own day,<sup>29</sup> and which is often represented on Attic vases. The instrument belonged rather to the flageolet class and had a mouthpiece. The true flute-type  $(\pi\lambda a\gamma/a\nu\lambda o\varsigma)$  was also known but little cultivated. It is sometimes seen as a short fife played by Fauns and Satyrs; or by Cupids, as on the urn of L. Minucius Felix in the Capitol Museum at Rome.<sup>30</sup> A more interesting type of wind-instrument, appearing in the Roman age, had a wing-joint, and resembled a bassoon. This is



Fig. 4.—Terracotta Figure at Susa. Woman with Pandura and Wreath.



FIG. 5.—TERRACOTTA FIGURE IN THE MUSÉE ALAOUI.

MAN PLAYING ON THE PANDURA.

seen on a sarcophagus in the Taormina Museum, here illustrated (Figs. 6, 7). It will be seen that the sculpture is late work. The heads of the figures are too big, the iris of the eye is hollowed out, and the hair and drapery are freely worked with the drill. The sarcophagus, which was meant for a child, may therefore date from the third century A.D. Besides the bass wind-instrument there are also a lyre, cymbals, a conch-shell, and a small pan-pipe in use. The name of the instrument is uncertain: it may have been the Bombalium.<sup>31</sup> There is, I believe, only one other example, which is seen on a small sarcophagus in the Vatican.<sup>32</sup>

whether the Pan in the British Museum (Anc. Mar. in B.M. iii. 135) is playing such an instrument. (Cf. the article in Baumeister s, v. Flöten.)

<sup>&</sup>lt;sup>29</sup> It had been perfected by Pronomus the master of Alcibiades. Paus. ix. 12. 5.

<sup>30</sup> Helbig, Führer, 440.

<sup>31</sup> This word occurs Epith. Laurent. 61.

<sup>&</sup>lt;sup>32</sup> Mus. Pio-Clem. v. 13. It is doubtful

The pan-pipe (Syrinx, Fig. 8) was one of the oldest Greek instruments, and was always put in the hands of shepherds and country deities. In pastoral



Fig. 6.—Sarcophagus in the Taormina Museum.

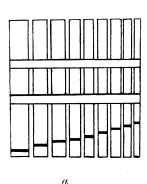


FIG. 7.—PART OF THE SARCOPHAGUS SHOWN IN FIG 6.

poetry it is often mentioned, and it appears in art as an attribute of Pan and of Fauns and Satyrs. It consisted of a row of pipes made of cane-stalk, each pipe being stopped by the natural joint of the cane, below which the

pipe was cut off. The pipes were put in a row, and, as Pollux says,<sup>33</sup> fastened together with thread and wax. Below and above the row of pipes two flat strips of cane were laid, and to these the thread was tied, going round the reeds and holding them firmly together. It is easy to see from ancient sculpture that this was the plan then followed, and a modern pan-pipe from Smyrna, now in my hands, has been put together in the same way.

In the Greek pan-pipe, the reeds all appear of the same length: there were as a rule about eight of these.<sup>34</sup> Such an instrument is played by



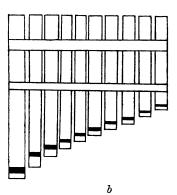


FIG. 8.—PAN-PIPES: (a) GREEK, (b) GRAECO-ROMAN. (The natural joints of the cane are shown in black.)

Calliope on the François Vase, and it appears as an attribute of Pan on Arcadian, Messenian, and Sicilian coins.<sup>35</sup> In later art it is rare, though there is a good example on a relief of the Hellenistic age in the Barracco Museum at Rome, representing Pan and the Nymphs.

As the reeds were all of the same length, how were the different notes made? Some have thought that there was a row of holes in the pipes at certain heights above the joints; but I have found that a hole in the side of the pipe takes away the musical tone altogether. It is not likely in itself, nor does it appear from the monuments that difference of thickness was the sole basis of the scale. Probably therefore the reeds instead of being cut off just below the joint of the cane, as in the modern pipe, were cut some inches longer than they were meant to be, and when the upper part of each had been trimmed to the length required, the lower ends were simply cut off so as to leave the pipes even, although the part of each pipe above the joint (which alone made the note) would be different in every case. The advantage of this plan would be that reeds of the same length would be easier to fasten together, and the pan-pipe thus made would be more handy to hold.

 $<sup>^{33}</sup>$  Pollux iv. 69 (σύριγξ) . . . ή μèν οὖν καλά-μων ἐστὶ συνθήκη λίνφ καὶ κηρῷ συνδεθεῖσα. The pan-pipe is also an attribute of Attis. Cf. the terracottas in B.C.H. xxi. 518–520. The reeds are all of the same length.

<sup>34</sup> Cf. Ann. d. Inst. 1877, 214.

<sup>&</sup>lt;sup>35</sup> P. Gardner, Types of Gr. Coins, Pl. II. 42. W. M. Leake, Numism. Hell. 17. Head, Hist. Num. 373.

The Roman form of the pan-pipe was also the Etruscan <sup>36</sup> and the modern shape: in this the reeds were cut off just below the joints of the cane, and so bound together as to leave the ends of the instrument sloping.<sup>37</sup> This became the recognised form in Graeco-Roman art, and it is very widespread on the monuments. It seems to have taken the fancy of the mediaeval restorers, so that countless statues have been embellished with pan-pipes in plaster.

Pan-pipes were made in all sizes; some had only four or five small reeds; one of these is seen on the sarcophagus from Taormina, already illustrated; some had as many as twelve reeds bound with three bands.<sup>38</sup> A piece of ribbon was sometimes fastened to the instrument by which it could be carried when not in use. The scale of the pan-pipe no doubt varied with the maker's taste, but it was probably diatonic as a rule: firstly because it would be the easiest to make in tune, and secondly because the murmuring or buzzing effect produced by gliding from note to note would have been harsh and dissonant on any other system. By strengthening the blowing each reed could be made to yield a note an octave higher than its normal pitch; so that perhaps the instrument with seven or eight reeds was strictly diatonic, while the more complex and rarer kinds had chromatic notes in between. The shape with a double row of pipes seems to have been invented by the restorers of statues in the middle ages.<sup>39</sup>

Literary references to the pan-pipe are very common: it will be enough to quote a pretty description from Claudian, which shows how the instrument was played. (*Epith. Pall. et Cel.* 34)

(Hymenaeus)... platano namque ille sub alta fusus inaequales cera texebat avenas, Maenaliosque modos et pastoralia labris murmura tentabat relegens, orisque recursu dissimuli tenuem variabat arundine ventum.

Besides the common pan-pipe which was blown from the top of the reeds, the Romans invented a more complicated kind known as the Etruscan Pipe. Pollux explains that this was made of bronze reeds and was played upside down, the smaller sort being blown by the breath.<sup>40</sup> Of this instrument the pan-pipes now extant in the Naples Museum are examples. The larger sort, says Pollux, was blown by water; so that it is clear that he is referring in both cases to primitive kinds of organ with

<sup>&</sup>lt;sup>36</sup> It appears on an Etruscan urn, Brunn, Rilievi d. Urne Etrus. 1, Pl. 92, 3; ef. Bull. Inst. 1886, 1, 161.

<sup>&</sup>lt;sup>37</sup> Cf. Ovid, *Met.* i. 710, disparibus calamis. <sup>38</sup> The pan-pipe on the glass krater in the Naples Museum (Cat. p. 91) has twelve reeds.

<sup>&</sup>lt;sup>39</sup> Thus the example in the Vatican (Amelung, Sculp. d. Vat. Mus., M. Chiaramonti 588)

is nearly all plaster.

<sup>40</sup> Pollux iv. 70 τοῦτο δὲ κατὰ ἔμπαλιν ἔχων δ Τυρρηνὸς αὐλὸς ἀντεστραμμένη σύριγγι παρεοικώς, χαλκὸς μέν ἐστιν ὁ κάλαμος, κάτωθεν δὲ ὑποπνεόμενος. φύσαις μὲν ὁ ἐλάττων, ὕδατι δὲ ὁ μείζων ἀναθλιβομένω καὶ αὔραν πνεύματος ἀφιέντι. For the instruments at Naples cf. C. Abdy William s, Class. Rev. 1902, 409.

some sort of mechanical fingering; and it is curious to note that from the pan-pipe which was deemed only good enough for shepherds should have grown the most majestic of all instruments. It is well known that the organ was highly developed in the later Roman age,<sup>41</sup> as may be inferred from a fine passage of Claudian (*De Mall. Theod. Cons.* 316).

Et qui magna levi detrudens murmura tactu innumeras voces segetis moderatus aenae, intonat erranti digito, penitusque trabali vecte laborantes in carmina concitet undas.

It is remarkable that this noble instrument described by Claudian served no better end than to amuse the crowd gathered in the amphitheatre, where its strains alternated with the feats of tumblers and the sallies of buffoons. But this after all may be characteristic of the music of the Roman age: it was no longer dedicated chiefly to the worship of the gods, or to the serious education of youth; the advance in skill and in the variety of instruments did not imply a real progress in the art, but rather led to virtuosity and false effect.

H. J. W. TILLYARD.

<sup>&</sup>lt;sup>41</sup> On the Roman organ v. Baumeister s.v. upon here. Flöten. The subject is too wide to be entered



Review: [untitled]
Author(s): Roy T. Will

Reviewed work(s): The Theory of Classical Greek Music by Fritz A. Kuttner, Meantone Temperament in Theory and Practice by J. Murray Barbour; Fritz A. Kuttner, The Theory and Practice of Just Intonation by J. Murray Barbour; Fritz A. Kuttner Source: Journal of Music Theory, Vol. 4, No. 2, (Nov., 1960), pp. 243-247 Published by: Duke University Press on behalf of the Yale University Department of Music

serialist orientation, including the favored retrograde inversion, but not called that or anything else in the way of a term, for that matter. But Dr. Hanson is not one to support twelve-tone methods of composition. In fact he finds opportunity to chide such methods on p. 33. Also the dedication of the book should be read. Yet this does not prevent him from lending a helping hand to "tone-row" composers in the Appendix to Harmonic Materials.

But there is a difference of purpose between serialists' aims and those of Dr. Hanson. Where the serialists seem to be working compositionally, that is, devising a structure that might be valid for a given piece, Dr. Hanson is aiming at a universally applicable organization. The serialist proceeds from the individual composition to generalizations about serial music; Dr. Hanson proceeds from generalizations of presumed universal value to the particular piece. Perhaps it is for this reason that the relation of the system to music, at least in the cases of most of the examples cited in Harmonic Materials, remains peripheral. Yet, a brief but interesting suggestion of how a composer might avail himself of the material of this book is supplied, perhaps unwittingly, by Elliott Carter on pp. 194-5 of the April, 1960 issue of The Musical Quarterly. If this is an augury, perhaps our children will thrive on Dr. Hanson's system. The gain will be Pyrrhic.

WILLIAM J. MITCHELL

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THE THEORY OF CLASSICAL GREEK MUSIC. By Fritz A. Kuttner, with the assistance of J. Murray Barbour. Musurgia Records, New York, 1955, \$8.50.

MEANTONE TEMPERAMENT IN THEORY AND PRACTICE. By J. Murray Barbour and Fritz A. Kuttner. Musurgia Records, New York, 1958, \$8.75.

THE THEORY AND PRACTICE OF JUST INTONATION. By J. Murray Barbour and Fritz A. Kuttner, Musurgia Records, New York, 1958, \$9.25.

In spite of the expressiveness of language, the basic element of music, pitch, defies an exact description in terms of language alone. The musician must resort to such terms as "like" something, borrow expressive adjectives from the other arts, or compare one pitch to another, e.g. "higher than" or "lower than." Even vibration frequency is meaningless without a reference instrument. When we refer to an "exact" pitch, such expressions as "a little sharp," "a little flat," "out of tune," or even "in tune" are necessarily vague. Is "out of tune" with what? What is "in tune?"

When we define intonation we must have a standard of some kind, and although we might assume that the equal tempered scale is here to stay, experimentation will quickly prove that practicing musicians use a great many systems of temperament, very few of which agree completely with equal temperament. So the intonation of intervals and

chords is still debatable; it will vary with instruments, chord functions, key, etc., and the question finally retreats into the psychological vacuum of "feeling" without being answered.

While this set of records cantell us the sound of various systems of temperament and the sound of music performed according to each system, our judgement is still influenced by what "sounds better," without any other criteria. There is no such thing as an absolute standard; it depends upon what we choose to accept as an absolute standard, together with its limitations and what we casually refer to as its "imperfections."

In the three records so far released, more than one hundred examples of various tunings are demonstrated, including equal temperament. The authors point out that while many of these tunings are theoretical, a few enjoyed actual use, and that just intonation — believed to be the ideal solution to the problem by many theorists and musicians — "... may be fully attainable in some acoustical fourth dimension."

The preliminary pages of each of the volumes which accompany the recordings (Sections I-VIII) are almost identical, and constitute the foundation on which each of the three volumes is based.

Section I, "Definition of Pitches and Intervals in Cents," gives a brief explanation of the system of logarithmic calculation of intervals in terms of cents proposed by Alexander J. Ellis in 1885. This system is generally accepted today and has become an "indispensable tool for all inquiries into musical acoustics, historical intonations, exotic, primitive and ancient musical scales." Those readers not familiar with the cent system will require supplementary explanations, as provided in the bibliography.

Section II deals with "A Short Survey of the History of Greek Musical Theory" (called "The Pythagorean Tone System in Antiquity" in Volumes II and III, which more accurately defines its contents.) As a survey, it is necessarily brief, and unfortunately, undocumented. An occasional reference to a "natural" third in connection with the discussion of Didymos and Ptolemy, as well as the statement that these men and their contemporaries knew more about the harmonic series than we are willing to give them credit for, are somewhat confusing to the reader until he realizes that by "natural" the authors mean "based on superparticular ratios." If there is evidence that either Ptolemy or Didymos actually knew of the harmonic series, it is not cited. Nor is a superparticular ratio "natural" because of its association with the harmonic series.

Section III, "Methods Used for the Preparation of this Recording," justifies the choice of medium: a small practice harpsichord with only one string per key, made by John Challis, with the addition of an electric organ (unnamed) for Volumes II and III. The author's justification is sound, and the recordings themselves bear out the accuracy of his judgement. By means of a stroboscopic frequency meter, the tunings are accurate within one cent, and "A," the center of reference for all intonations, has been kept at 440 cps for an absolute pitch. Although playback may be responsible for a variation of "A," all intervals and relative pitches remain precise within plus or minus one cent.

Section IV, "Listening to the Recording," offers the first of two reasons for making the recordings. Having warned that "our modern ears have become lazy and indifferent by contemporary listening diet which consists of nothing but equal temperament intonation and its admixtures of 'Pythagorean' and natural intonations," we are told that "a few hours of concentrated listening and many repeated hearings of the demonstrated examples will normally be required, before a clear and sensitive definition of the sound phenomena begins to form." As if this were our goal, the author continues: "The results of this short period of training and preparation are always gratifying: a new sense of interval and intonation values develops, together with a keenness of discrimination which is very useful to the singer and instrumentalist alike. and highly stimulating to the critical observer and listener." However this may be, our "lazy and indifferent" ears, also called "modern ears," are called upon to make a good many arbitrary decisions based on preferences in the examples of the various intonations which follow. Nor is it a matter of "a few hours of concentrated listening," for, according to p. 26, the "process of converting listening habits (in regard to non-Western music) takes normally several years of acclimatization to unusual intervals." Various references are made to tests which the author has conducted at some time in the past and whether it is a matter of hours or years, even the author seems to be unsure.

Section V lists a few "References" for each Volume.

Section VI, "The Pythagorean Tone System Twelve Cyclic Steps Upwards," Section VII, "The Pythagorean Tone System in Medieval and Renaissance Usage," and Section VIII, "The Divisive System," all deal with Greek tuning theory. There are excellent tables and diagrams, and with the conversion of cyclic ratios into cents, the explanation is entirely adequate.

Thus end the introductory pages for all three volumes. Continuing in Volume I, are the commentaries to the recorded examples, thirty-eight in number. There are three examples of Pythagorean intonation in the practice of the Middle Ages and Renaissance period, and four examples of Pythagorean intonation applied to organum and early polyphony. The first few of these examples are designated as "ear training in micro-intervalic pitch discrimination."

The remainder of the examples of Volume I are devoted to Greek theoretical tunings, including a number of different scales, further discussion of Greek music theory, and various performances of three of the Greek relics. Most inadequate is the discussion of mode, which the author himself has found to be inadequate in other sources, and which is more so here, in spite of his treatment. He believes that mode is almost entirely a matter of intonation, without which a diatonic mode is "an empty form without meaning." This is true even in Pythagorean diatonic intonation, and "it is for this reason that Medieval and Renaissance music failed to develop a modal theory that could really be called significant, original in its own right and independent from Greek thought." However, "as soon as we realize that the ordinary Pythagorean diatonic was only one of dozens of Greek intonations... a mode takes on an overwhelming significance." And, "... every change of mode within the scale creates not only a new scale, but it seems almost

a change of national, racial or territorial character of the scale in the melody." As a result, we are told that modal writing decreased until its disappearance altogether in the Baroque era, when "western music was content with the diatonic and chromatic scale in one single intonation and had to develop other complexities and sophistications: harmony, polyphony, orchestration."

Granted that intonation is extremely important in the history of music, it seems over-enthusiastic to maintain that it had quite such a major role in shaping compositional practice. (The author states, in Volume II, that he would be interested in an investigation of the methods of tuning and tempering and their influence on the rules of musical composition as they were developed during the Renaissance and Baroque eras; so apparently the matter is not settled.)

The second, and certainly the most important aim of this recording is "to present living sound, in the hope that this might contribute to a better understanding of Greek music theory the same way as the learned arguments of scholarly philology or musicology." One cannot help but agree with this justification, and only through the medium of a recording could such a purpose be accomplished.

Volume II, dealing with meantone temperament in theory and practice, both benefits and suffers from the same kind of treatment found in Volume I. There is an excellent exposition of the practice of meantone tuning, various recorded examples of intervals and scales, and 16 examples of compositions from the 16th, 17th, and 18th centuries, performed in various scale tunings.

Volume III deals with the theory and practice of just intonation, and although it includes 17 compositions recorded in various just intonations, we are told that "the inclusion of these examples is not intended to imply that these were so performed at the time they were written, for it is very doubtful that this tuning system was ever of practical importance." In conclusion: "There is no such thing as just intonation, but rather many different just intonations. Of these, the best is that which comes closest to the Pythagorean tuning. The practical western musician need but recognize it for what it is, and keep it firmly in its place: in the studies of archeo- and ethno-musicology, and in the textbooks on musical acoustics."

Here we have just intonation "debunked," and except for string and wind instruments, and to a certain extent, vocal music, there is no doubt but that the author is absolutely correct. Those adherents to a "natural" theory of music would cling to just intonation as the only manifestation of a natural theory of music, even though its imperfections would make it almost completely impractical in practice. The author states that "Zarlino, Mersenne, and Rameau, presented just intonation as the theoretical basis of the scale, but temperament as a practical necessity." This statement is only partially true. All three theorists, and many others, were led to some treatment of just intonation by way of their use of superparticular ratios, and the need for superparticular ratios in any kind of harmonic theory. However, superparticular ratios and just intonation are two different things, even though they seem to share basic elements. All three were "natural"

theorists, and derived natural theories of harmony, and, in the case of Rameau, of scale. But the recognition of the need for temperament in no way destroyed the harmonic theory based on superparticular ratios nor the theory of scales which resulted.

All things considered, this set of recordings and the accompanying volumes, are well done, and extremely valuable to the historical theorist. Five additional records are in preparation, including irregular temperaments, Chinese music theory, Arabic music theory, Indian music theory, and one dealing with quarter-tone music and other modern experimental scales. All volumes are based in great part on J. M. Barbour's Tuning and Temperament; A Historical Survey, which is an almost essential reference for anyone who would use these recordings intelligently.

ROY T. WILL

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Review: [untitled]

Author(s): E. Kerr Borthwick

 $Reviewed\ work (s) \hbox{$:$ Greek\ Musical\ Writings,\ Vol.\ 2:$ Harmonic\ and\ Acoustic\ Theory\ by\ Andrew}$ 

 ${\tt Barker}$ 

Source: Music & Letters, Vol. 72, No. 1, (Feb., 1991), pp. 69-71

Published by: Oxford University Press

## **REVIEWS OF BOOKS**

Greek Musical Writings, Vol. 2: Harmonic and Acoustic Theory. Ed. by Andrew Barker. pp. viii + 581. (Cambridge University Press, 1989 [1990], £55/\$79.50.)

The first volume of Andrew Barker's substantial and impressive contribution to the 'Cambridge Readings in the Literature of Music' series—The Musician and his Art (1984)—contained a mixed bag of translated portions of musical passages culled from Homeric epic, early lyric poetry, Attic tragedy and comedy and—from prose literature—chiefly excerpts from Xenophon, Plato, Aristotle, Athenaeus and, most substantially, the De musica attributed to Plutarch. All these authors of course exist in English translation elsewhere, but it was most useful for workers in this field, with or without expertise in the Greek language, to have so much of the relevant material brought together, and with substantial annotation.

By contrast, this new volume, Harmonic and Acoustic Theory, which contains a high proportion of the formidable technical treatises mostly from the post-classical period, includes a good deal of difficult material which has never before been available in translation (English at least). For it is surprising how little interest the Loeb Classical Library has shown in covering either the shorter musici scriptores found in the Greek Teubner text of Karl von Jan (1895) or the three most voluminous extant musical works of Aristoxenus, Ptolemy and Aristides Quintilianus. True, there was the translation by H. S. Macran (1902) of the firstnamed, but Ptolemy's treatise is now completely available for the first time in English (though there is the German version by Ingemar Düring); and, although quite recently (1983) a translation of Aristides was published by T. J. Mathiesen, this, while containing useful notes, was unfortunately marred by frequent translation errors.

The distribution of works between the two volumes has meant that some authors appear in both. The well-known sections of Plato's Republic and Laws and Aristotle's Politics, which deal with social and ethical views about music, appeared in Vol. 1, but now a few additional technical passages of Plato (especially *Timaeus*) are more appropriately located in Vol. 2. It is perhaps a pity that a curious, and textually problematic, passage of Philebus 56a (which Barker himself has written about recently in Classical Quarterly, xxxvii (1987), 103-9) is not found in either book. In the case of genuine Aristotle, he has culled a number of passages where the uninformed reader might not expect to find musical references. From other works attributed to him, he includes the interesting De audibilibus, and from two of the books (11 & 19) of the Problemata (of Peripatetic derivation at least), we find several excerpts here, in addition to those deemed more appropriate to Vol. 1. Indeed two of the Problems (19.23 & 39) appear, for some reason, in both volumes, and it is not entirely clear why others have been passed over altogether-including, for example, 19.33, about the note mesē as 'leader' of a tetrachord, a statement which used to arouse much interest in books on Greek music. Other, less familiar authors, of interesting, if uneven, content, who now receive their English baptism are Theon of Smyrna, who wrote a work bravely entitled 'Mathematics Useful for Reading Plato'; Nicomachus of Gerasa, whose Enchiridion belongs to the Pythagorean tradition; and Porphyrius, parts of whose commentary on Ptolemy are

Barker has added also a first translation of a lesser-known piece of Aristoxenus, the extant second book of his *Elementa rhythmica*, which, oddly enough, has been followed within a matter of months by a text, translation and commentary of this same work by Lionel Pearson (reviewed below, pp. 71-74), which, however, has the bonus of adding material, assumed to be Aristoxenian, preserved in the Byzantine writer Michael Psellus, and an interesting fragment from one of the early Oxyrhynchus papyrus discoveries. Mention of Psellus

reminds me that Barker unfortunately seems to have overlooked (since the item is not even mentioned in his substantial bibliography) some novel and striking musical details apparently relevant to the classical period, though unattested in extant older sources, found in the Byzantine treatise on tragedy published by Robert Browning in Geras: Studies Presented to George Thomson on the Occasion of his 60th Birthday (1963). These include notably the new term anatrētos tropos (literally 'bored through' style), used to characterize ironically a feature of the 'new music' of the avant-garde musicians of the day, which I have explained in Browning's publication, and subsequently in Hermes, xcvi (1968), 69-73, with reference to the chromatic kampai ('bends') and murmēkiai ('ant-tracks') joked about by the comic poets Aristophanes and Pherecrates.

Not all the specifically musical works of the post-classical period have been thought worth including, notably the Adversus musicos of Sextus Empiricus (rather a dull piece, though containing a few things of interest, and available in English in the Loeb Library and in a more recent translation by D. D. Greaves) and the De musica of Philodemus, which survives partly in carbonized papyrus rolls from Herculaneum. The fragmentary nature of the latter makes its omission understandable, though the fourth book is reasonably substantial and coherent, and has been translated before into Dutch (van Krevelen, 1939) and German (Neubecker—twice misspelt in Barker's bibliography—1986). There is also an Italian translation of the first book by Rispoli (1969). The author(s) known as 'Bellermann's Anonymus' is also omitted, though a few important passages, such as those referring to notation and solmization are accounted for in notes on other authors, notably Aristides Quintilianus; so too is Alypius, whose importance is limited to his providing the most substantial evidence in the literary sources for Greek musical notation. Barker understandably excludes the special area of actual musical documents from papyrus and stone, which confirm such a notation system.

The special problem about what to do with sporadically recorded technical musical material preceding Plato has been well handled here. This of course involves especially the contributions to musical theory attributed to Pythagoras and his mathematical successors, notably Philolaus and Archytas. I dare say that a great many people, who turn to the Greek theorists expecting to be gratified by learning about the actual music so highly praised for its beauty or moral value (or deplored for its depravity) by the better-known philosophic writers, are disappointed, or even repelled, when they plough through pages of descriptions of scales based on numerical ratios, and begin to wonder whether these writers ever listened to music or actually enjoyed the sound of it. (Even the great Ptolemy proves most disappointing in this respect.) But in an interesting appendix analysing three such passages attributed to Archytas' 'scalar divisions', Barker tries to show that, in preferring the 5:4 ratio for the major third, which makes the upper interval of an enharmonic tetrachord, to the strict Pythagorean 81:64 ditone, Archytas had taken into account the fact that practising musicians, however strict their 'tuning by concordances' might be, 'sweetened' the interval and made it 'more aesthetically agreeable' by a slight tightening of the lower-pitched string, and was thus 'seriously concerned to represent systems belonging to real musical practice'. (It is, incidentally, maddening how uncertain we remain, in spite of all the extant works of the Greek musical writers, about the blowing and fingering of the aulos or the tuning and playing of the lyre or kithara.) Another appendix of Barker's at the end of Ptolemy's second book struggles with his account of attunements of string instruments, presumably of his own age. I do not recall noticing any mention of one offhand allusion, in the second-century rhetorician Dio Chrysostom (68.7), about tuning the remaining strings from the 'middle note' mesē.

Many would readily trade in some of the less interesting or repetitive of Jan's musici scriptores (and Barker excludes from his choice of works Bacchius, Cleonides and Gaudentius) for substantial fragments of a pair of earlier important names who lurk in the background of the extant authorities. One is Lasus of Hermione: only small quotations from this sixthcentury BC poet and musical innovator remain, though unfortunately none of his so-called asigmatic poems. When Barker mentions the existence of this rather bizarre type of composition (the Greeks seem to have had some aesthetic dislike of sibilants in musical performance), he might have referred to a papyrus fragment of some 60 such trimeters published

not long ago (see E. G. Turner in *Museum helveticum*, xxxiii (1976), 1-23). The other is Damon, the enigmatic, but certainly influential, friend and adviser of Pericles and Socrates, to whom Plato (with unusual deference) assigns such importance in musical education. A glance at Barker's index shows how often his name recurs. However, evidence of any actual written works by him is unclear, though Aristides seems to have had access to attributable material, and it is likely enough that the latter's obsessive preoccupation with a significant difference between male and female elements in music goes back to Damon. It is Aristides, I think, who, for all his quirkiness and his astrological and numerological speculations, will probably most interest readers of this excellently annotated volume, and may result in more attention being directed towards a valuable and neglected author.

To sum up, Dr Barker has produced a most useful aid both for classical scholars and for Greekless readers interested in the history of music; for, while any Greek words quoted are transliterated and glossed for non-specialists, at many points the notes contain detailed discussion of textual problems, and occasionally his own readings, which differ from the currently available Greek texts.

E. KERR BORTHWICK



Review: Greek Musical Ethos Author(s): E. K. Borthwick

Reviewed work(s): Ethos and Education in Greek Music: The Evidence of Poetry and

Philosophy by Warren D. Anderson

Source: *The Classical Review*, New Series, Vol. 18, No. 2, (Jun., 1968), pp. 200-203 Published by: Cambridge University Press on behalf of The Classical Association

before the hypothesis can be coherently discussed. For example, if the poet composed orally (and was a 'botcher', 133) the alleged use of language designed for a different context may have a far simpler—and less sinister—explanation.

Butterworth buttresses his argument here with some inaccuracies. He asserts that the  $\phi \hat{a} \rho os$  (120) is not a normal garment for epic heroes. Yet Agamemnon dons  $\phi \hat{a} \rho os$  and  $\chi \iota \tau \acute{\omega} \nu$ , Iliad ii. 42 f., where his role is certainly not that of a shaman. Nor had Nausicaa (124) taken only her own clothes to wash (Odyssey vi. 57 ff.): it is not surprising that she had a  $\phi \hat{a} \rho os$  and a  $\chi \iota \tau \acute{\omega} \nu$  with her, nor that Odysseus (and elsewhere Telemachus) should wear them.

Like most recent writers on the period, Butterworth makes much use of the concept 'shaman'. Unlike many, he understands its use in its proper context. However, 'shaman' is a quicksilver and multifaceted concept; and of the history of early belief in Greece we know little. It is tempting to assume that if a shadowy individual, whose very historicity is doubtful, possesses one characteristic which shamans also possess, he must have been a shaman. But it does not follow that, if shamans (say) carry tridents, everyone who carries a trident must be a shaman.

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A. W. H. ADKINS

### GREEK MUSICAL ETHOS

Warren D. Anderson: Ethos and Education in Greek Music: the Evidence of Poetry and Philosophy. Pp. 306. Cambridge, Mass.: Harvard University Press (London: Oxford University Press), 1966. Cloth, 44s. net.

PROBABLY many people who are perplexed, or repelled, by the more intractable problems of the technicalities of Greek musical theory are nevertheless intrigued by the so-called Ethos doctrine applied to music, both with regard to education (notably in the Republic and Politics), and in the wider context of aesthetics. And although in Greek music itself one cannot be studied in isolation from the other—one obviously cannot discuss modal ethos without trying to determine what was the nature of 'mode' itself—the basic attitude of the Greek philosophers, that soul, or character, could be influenced temporarily or even permanently by habituation to a certain type of music, and that it was therefore a matter which should be of the closest concern in the education of the young, remains a point of view which should perhaps not be overlooked even in the quite different musical climate of today, when the ubiquitous transistor radio provides for many the continuum of musical sound which some Pythagoreans attributed to the cosmic harmonia, whose perfection could be imitated in the revolutions of the human soul, and so find limited expression in man-made music, and be appreciated by those who could discern the similarity (cf. Iambl. De myst. p. 120P).

Professor Anderson's book is the first in English to be devoted exclusively to the investigation of Greek musical ethos. His four central chapters are on pre-Platonic literature ('From Pindar to Aristophanes'), Plato, Aristotle, and the Hibeh musical papyrus and Philodemus; with the exception of the last writer, therefore, he is concerned only with evidence for the classical period, and his scope is narrower than Abert's in his famous book *Die Lehre vom Ethos*, in which

were collected texts relating to melodic and rhythmic ethos over a wider range of Greek literature. It differs too in being aimed at a more general reader, Greek being used—in English transliteration—sparingly in the text; but a full quarter of the book consists of notes, in which more intensive discussion of textual or interpretative problems is sometimes undertaken, with up-to-date bibliography of books and articles for more specialist study. The author is clearly well read in the literature on this topic, and punctilious and judicious in his assessment of conflicting views put forward by other scholars.

Writing in 1926 Théodore Reinach said of theories of Greek music, stubbornly maintained by earlier writers, 'un des plus grands inconvénients du dogmatisme intempestif, c'est d'engendrer le scepticisme', and clearly his prophecy was fulfilled in the late Mrs. Henderson's rather deflating account of Greek musical theory in the New Oxford History. Anderson gives an impression of caution in steering a middle course between dogmatism and scepticism. I am glad that he has grappled with the intractable text of Philodemus De musica, much neglected in English scholarship at least, but regret that the special problems of rhythmical ethos are somewhat neglected, as they 'would require a separate study' (p. 11), since the ethnic and stylistic associations of certain metrical forms, quite apart from melodic patterns or characteristic scales, were of great importance—for example, when [Plut.] Mus. 1143 B estimates the factors which contributed to the ethos of a melody of Olympus, he stresses that the paeonic rhythm was effective, no less than the enharmonic genus and Phrygian tonos.

Inevitably, the most controversial question about musical ethos is, how much of the origin of the theory, and in particular what is found in Plato, should be attributed to the enigmatic figure of Damon? Anderson has already (T.A.P.A. lxxxvi [1955], 88) committed himself to an estimate of Damon's originality and importance much less extreme and enthusiastic than that which accumulated in a number of books and articles, notably by Schäfke, Ryffel, Lasserre, and Hermann Koller, and his position is firmly maintained here. The fact is that, unless a lucky papyrus find provides some new information, we are left with a small number of specific attributions in Plato, Aristides Quintilianus, Philodemus, etc., and a guessing game about how much of the additional matter in these authors takes Damonian doctrine for granted without acknowledging the source. My own view is that, even granting that Plato—perhaps even Socrates—made his own positive and original contribution to the educational musical doctrines which are associated with Pericles' counsellor and friend, whom Nicias admired, and who was thought by 'the many' to be 'a frightful nuisance' and 'far too clever' (Plut. Per. 4 and Arist. 1 respectively), we have the authority of Damon's own name for what are the two most intriguing and seminal viewpoints on the whole subject of music's influence on private character and public social order. The former is the sentence in Aristides p. 80 W.-I. on the power of music to evoke and mould a previously non-existent, or latent, character in the auditor, with its important clue to the importance of the φερόμενοι φθόγγοι of the harmoniai; the second is the famous dictum of Rep. 424 c about changes in musical styles which prefigure changes in πολιτικοὶ νόμοι οἱ μέγιστοι. I suppose many regard this latter statement as an eccentric speculation in which the cart is put before the horse, and are contemptuous of the legislation proposed by Plato. Yet, without going so far as to

<sup>&</sup>lt;sup>1</sup> Cf. my review of Lippman's recent Musical Thought in Ancient Greece, C.R. lxxx (1966), 208.

accept the application of the Damonian doctrine to all musical history, as was once done by Cyril Scott in his 'vindication of Plato', I cannot help feeling that Damon had, with remarkable vision, hit upon an important—and probably recurrent—correlation between music (and the arts in general) and social change. If he was right, we are presumably exposed already to the music which belongs to the year 1984.

A number of individual points: P. 3: 'No one before Aristotle is known to have formulated a distinctively aesthetic approach to music'—perhaps not, but the experiments of Lasus and titles of lost poetical and musical writings of Democritus suggest a different approach from the purely ethical one; and does Socrates' question about the κάλλιστον μέτρον in the 'Damonian' passage of Nub. 641 imply what one might call an aesthetic judgement (cf.  $\pi \epsilon \rho l$  καλλοσύνης ἐπέων as a Democritus book title)? Pp. 50, 55: In Pherecrates fr. 145 Anderson tacitly accepts emendations of manuscript readings δώδεκα to ἕνδεκα and ἐννέα respectively without offering defences of the changes (cf. Düring in Eranos xliii [1945], 181). But quite apart from the musical implications,  $\delta \omega \delta \epsilon \kappa \alpha$  as a round number is probably important for the doubles entendres in this passage (cf. Ar. Ran. 1327–8, Plat. Com. fr. 134, and the work of Paxamus called δωδεκάτεχνον). P. 55 n. 53: For χορδή used in malam partem see Lyc. 139 and schol., A.P. 5. 99, as well as many examples of  $\nu \in \hat{\nu} \rho \rho \nu$  in this sense. P. 57: He does not explain why Agathon's 'Phrygian foot' in Thesm. 121 should indicate Hypophrygian mode (not Phrygian, as schol. ad loc.). Perhaps because of the commonly made identification with the 'Iaστί, along with the Ionian reference in line 163 and the prevailing Ionic rhythm of this parody? Or because [Ar.] Pr. 19. 30 mentions this mode as suited to monodies  $\partial \pi \partial \sigma \kappa \eta \nu \hat{\eta} s$ ? But we now have the evidence of the interesting Byzantine Treatise on Tragedy (Browning in the George Thomson Studies—its publication may have been just too late for inclusion in Anderson's book, since it is not in the bibliography) that Agathon first introduced the Hypophrygian tonos into tragedy. P. 59—cf. p. 232, n. 57, p. 233, n. 62: The most curious error of fact I noticed is Anderson's repeated statement that in Frogs 1281-2 it is Euripides who is criticized for taking his lyrics from kitharodic nomes. It is, of course, Euripides who takes Aeschylus to task for this old-fashioned practice—as a composer of today might be jeered at by a dodecaphonist (ἀνὰ τὸ δωδεκαμήχανον Κυρήνης μελοποιῶν) for composing in the style of a Bach cantata.

P. 77: with regard to the statement in [Plut.] Mus. 1136 E that Damon was the 'discoverer' of the 'relaxed Lydian' harmonia, from which Anderson concludes that, if authentic, 'then Plato indirectly banned from Kallipolis a discovery of Damon's', the apparent contradiction may be explained if Damon did not so much 'invent' this mode, as demonstrate for the first time the characteristic note sequence which was featured in a type of music which (presumably) he did not regard as suitable for education: that is, he was a technical authority in the distinguishing of scales and modal patterns of all types, and the attribution of an invention to him may mean no more than that his expertise naturally extended to the analysis even of those musical forms which Socrates/Plato agreed to outlaw.

P. 153: Music as a 'profitless pursuit': the controversy about music's  $\omega \phi \epsilon \lambda i \alpha$  (frequent in Philodemus and in the similar arguments of Sext. Emp. adv. mus.

<sup>&</sup>lt;sup>1</sup> Students of Greek musical ethos may throughout the Ages—recommended for its not know his book Music: Its Secret Influence curiosity value at least.

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E. K. BORTHWICK



Review: [untitled]

Author(s): E. K. Borthwick

Reviewed work(s): Musical Thought in Ancient Greece by Edward A. Lippman Source: *The Classical Review*, New Series, Vol. 16, No. 2, (Jun., 1966), pp. 207-208 Published by: Cambridge University Press on behalf of The Classical Association

sound of poetry. The sharp contrast between French, least 'quantitative' of European languages, and ancient Greek has clearly stimulated the author to the fullest effort of auditory imagination in order to realize these complex rhythms, especially since he cannot so easily as English, German, or Scandinavian readers fall back on the loose analogies of stress. I would only complain that in his devotion to what he evidently feels to be the noblest achievement of rhythmic maturity, the full complexity of the Sophoclean lyric, he is apt to dismiss the early lyric poets as fumbling beginners who present 'les formes les plus arrêtées de la poésie grecque'. The prodigiously inventive genius of Archilochus has somehow eluded his grasp; and surely in  $\hat{\omega}$   $\pi a \hat{\iota}$   $\pi a \rho \theta \ell \nu \iota \nu \rho$  Anacreon has with the placing of every word in those four lines achieved a miracle of perfection unsurpassed in the history of Greek metric.

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A. M. DALE

# MUSICAL THOUGHT IN ANCIENT GREECE

EDWARD A. LIPPMAN: Musical Thought in Ancient Greece. Pp. xiii+215. London: Columbia University Press, 1964. Cloth, 37s. 6d.

Although a thorough and comprehensive book on this subject in English would be a valuable accession to Greek musical scholarship I must confess that I do not find that this modest study by Professor Lippman makes a very notable contribution to work in this field. The author is an Associate Professor of Music at Columbia University (whose Press is to be complimented on the excellent appearance of the book, said to be part of a series which will carry the history up to the twentieth century); and clearly his work does not aim to rival in terms of the collection or elucidation of material basic to such a study many of the books cited in his lengthy bibliography of twenty-three pages which have appeared between Hermann Abert's celebrated Die Lehre vom Ethos in der griechischen Musik and the recent technical dissertation by Lukas Richter Zur Wissenschaftslehre von der Musik bei Platon und Aristoteles (which is not actually mentioned by Lippman). No Greek is quoted apart from occasional transliteration of some technical terms (not always accurate, by the way—I note Armonia in citing Meyer's dissertation, Paramoiosis, and it is implied that kyklios is a noun in a discussion of the word enkyklios), and there is no detailed discussion of specific texts.

If the specialist does not find a great deal that is new or illuminating, I suspect that the general reader will continue to be frustrated by the abstract nature of so much Greek musical speculation when it served so many different ends little connected with the sonorities of actual music-making and musical experience. Nevertheless Lippman in his first chapter ('Conceptions of Harmony') gives an adequate sketch of the musical thought which pervades much of the cosmological speculation of the Pre-Socratics, contemporary medical terminology, and the musical-mathematics of Pythagoreanism and the *Timaeus*.

The second chapter ('Theories of Musical Ethics') summarizes the history of the rise and decline of Athenian traditional education in music, chiefly as seen through the eyes of those critical observers, Aristophanes and Plato. The influence of Damon in these matters is given due prominence: the existence

of his Areopagiticus oration is accepted without comment (p. 69), and the possibility that the diatribe of the Hibeh papyrus against the ethical viewpoint refers directly to Damon's theories is mentioned (p. 113), also, however, without any discussion. Rather surprisingly the roles of Dorian and Phrygian modes in the *Republic* 'which imitate temperance and courage respectively' get themselves reversed (pp. 71–72).

The third chapter ('Philosophy and Aesthetics of Music') contains a discussion of the cleavage between 'noetic' and 'sensible' music: 'The sensible and changing harmoniai with their multiplicity of genera, all produced by particular tensions of strings and of the voice, are the approximate realization of underlying systemata and ideal ratios' (p. 109). The final chapter ('The Peripatetics') deals primarily of course with Aristotle and his indebtedness to, and in part his rejection of, the Platonic standpoint, in view of his concentration on the physics and psychology, rather than the metaphysics, of music. Lippman surveys the many references to vocal and instrumental music, especially in connexion with acoustical and physiological problems, in the whole of the Aristotelian corpus, including the eleventh and nineteenth books of the Problemata which seek 'scientific explanations for psychological phenomena and the particularities of musical experience' (p. 143), showing that by this time the ethos doctrine makes a less significant appearance in criticism, being retained 'only by the force of tradition'. Finally there are a few pages on Aristoxenus and Theophrastus—Lippman pays more attention than is often done to what is known of the latter's musical writings through quotation in Porphyrius, deploring the loss of his contribution to aesthetic theory and seeing in him 'probably the originator of a comprehensive aesthetic theory built on a natural or biological foundation' (p. 164).

This chapter on the Peripatetics is, I think, the most useful part of the book. On the debit side, however, is Lippman's failure to make any mention (except in the bibliography) of Philodemus and the Epicurean opposition to the traditional ethos doctrine, which continued to meet the approval of those members of the Stoic school who concerned themselves with music. Philodemus' continual reference to his opponents makes him a most useful repository of earlier views, and as it is he who cites with approval certain statements of Democritus about music I doubt if Lippman is right in seeing Democritus' outlook as being 'not very different from Pythagorean and Platonic conceptions'. More likely he was an early critic of the moralizing attitude to music; the titles handed down of his musical writings suggest that he was a pioneer in the study of the purely aesthetic or acoustic aspects of music, and Abert classed him among the exponents of 'die formalistische Richtung' in contrast to 'die ethische Richtung'. Nor is Plutarch taken sufficiently into consideration: quite apart from the *De musica*, which is of doubtful authenticity, there is a good deal of material elsewhere in the Moralia which deserves at least passing mention in any synoptic study of Greek musical thought.

University of Edinburgh



Review: Plato and Aristotle on Musical Theory

Author(s): E. K. Borthwick

Reviewed work(s): Zur Wissenschaftslehre von der Musik bei Platon und Aristoteles by Lukas

Richter

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feature, now on that, and gradually we begin to understand something of the true configuration of the whole mass.

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ROBERT BROWNING

# PLATO AND ARISTOTLE ON MUSICAL THEORY

LUKAS RICHTER: Zur Wissenschaftslehre von der Musik bei Platon und Aristoteles. Pp. xi+202. Berlin: Akademie-Verlag, 1961. Paper, DM 29.50.

Although the importance of music in the works of Plato and Aristotle has always been given general recognition, it is perhaps surprising that it has rarely been made the subject of individual comprehensive treatment. Recently, however, we have had a long book by Moutsopoulos on Platonic music, followed closely by this study by Richter. It should be said that there has been considerable delay between the completion of his book (originally a dissertation) and its publication, since not only is Moutsopoulos' book unknown to him, but he mentions (p. 5) that the 1954 editions of Plutarch, *De Musica* (Lasserre), and Aristoxenus (Da Rios) were accessible to him only after his work was completed. Düring's reconstruction of the *Protrepticus* has also appeared too late to influence Richter's account of its content in his first chapter on Aristotle. In other respects, however, a feature of this book is its full and careful documentation, and references to a wide range of both ancient texts and modern commentaries.

The author's purpose is 'den Ort nachzuzeichnen, den die Musik im Wissenschaftssystem der beiden Philosophen innehat, und die Beziehung des Musikwissens zur Praxis zu bestimmen', and to demonstrate how Plato and Aristotle, and through them the theorists of later antiquity and the Middle Ages, came to regard the study of 'mathematical harmonics' in its own right 'als legitime Musikwissenschaft'. He is not then primarily concerned with the better-known sections of Republic, Laws, and Politics on musical education and the theory of art (although the Damonian ethos doctrine is touched on, also the discussion in the eighth book of the Politics on the extent to which the practice of music is necessary for the formation of a critical judgement), nor with the cosmic music of Timaeus and Rep. x. More germane are such questions as Plato's attitude and indebtedness to Pythagorean musical theory and the influence of Archytas (here van der Waerden's article in Hermes lxxviii is followed closely), the place of music in the late Platonic classifications of Philebus, etc., and the development of his views by Aristotle in the early Protrepticus and later in the Ethics, Metaphysics, etc.

After some comments on terminology (e.g. μουσική, τέχνη, ἐπιστήμη), Plato's illustrations from practical musical activity in the early dialogues are examined briefly, but three passages are treated at greater length. Particularly interesting is the discussion of *Phaedrus* 268 d, the distinction there of ἀρμονικός and μουσικός, and the identification of ἀρμονικοί as a class of experts in Greek

<sup>&</sup>lt;sup>1</sup> Richter's view that Aristotle discussed theoretical and practical music is to be found in the *Protrepticus* the relative importance of also in *Hermes* lxxxviii (1960), 177 ff.

musical life. Richter collects other uses of άρμονικοί, άρμονικά in Plato and Aristotle, referring also to their occurrence in the Hibeh musical diatribe, Aristoxenus, etc., and shows how the terms underwent certain modifications of direction and emphasis as the theoretical aspect of Greek music continually diverged from the practical instruction of the schools, while even the theoretical part divided according to its degree of abstraction from acoustical phenomena. The pre-Aristoxenian harmonists are to be distinguished from both the Pythagorizing mathematical theorists (who received Plato's qualified approval) and from practical teachers engaged in actual music-making, although they made elementary investigations into intervals, tunings, scales, and melodies. Plato's dissatisfaction with the aims of both musical empiricists and those who investigated acoustical phenomena in terms of ratios is expressed in the famous passage of Rep. 531 a-c. The conflicting interpretations of this passage are admirably discussed by Richter, and also its aftermath—for it was much quoted by later Platonists in vindication of their master's ideals, and the phrase ὧτα τοῦ νοῦ προστησάμενος applied (unfairly) to Aristoxenus by his critics.

From the later dialogues, the notorious textual difficulties of *Philebus* 56 a in particular are examined at some length, and the various interpretations and emendations compared. Richter defends the received text, taking  $\chi o \rho \delta \dot{\eta} =$  'Tonstufe',  $\phi \epsilon \rho o \mu \dot{\epsilon} \nu \eta s =$  'wenn er erklingt', but is not averse to accepting the reading of Ven.  $\Sigma$  αὐλητικὴ καὶ κιθαριστική, or even καὶ ψαλτική on the ground that αὐλητὴs καὶ ψάλτηs of Speusippus frag. 29 may be a reminiscence of Plato's words in the *Philebus* passage which it resembles.

In the latter half of the book Richter brings out well both Aristotle's indebtedness to Pythagorean and Platonic musical theory and his criticisms of it, the conflict being aroused through his more conscious recognition of the value of practical demonstration in music, and his comparative lack of hostility towards its 'psychagogic' content, which is exemplified in the introduction of the aesthetic term  $\delta\iota\alpha\gamma\omega\gamma\dot{\eta}$  in the *Politics*. Harmonic science was for Aristotle 'a physical branch of mathematics, which has to deal with special acoustically perceptible objects belonging to the realm of physics according to the procedure of mathematics' (p. 189), so that he could not accept entirely Plato's uncompromising separation of it from acoustical experience.

Finally, Richter extends his survey to include some sound observations on Aristoxenus, and the further developments of the *Logos-Aisthesis* controversy in Ptolemy and others. There is also a concise summary of thirty main points established in this painstaking and valuable study. There are a number of small misprints (mostly breathings or accents) in the Greek texts; otherwise the book maintains in content and presentation the accuracy and clarity of this series.

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Review: Greek Metric Author(s): A. M. Dale

Reviewed work(s): La metrica greca by Carlo del Grande

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ingenii et c.p. L. Neither of these readings, as certain as they are simple, was beyond the conjectural ability of renaissance humanists; but in aggregate the number of comparable lections in L is such that one is forced to posit either an anonymous emendator of great skill and felicity or access to a manuscript of non-Medicean descent. Koestermann has decided in favour of the second of these alternatives, and the logic of both his text and his apparatus criticus stems from that judgement. In his recent edition of the Annals he seemed at times to have admitted readings only because they were in L: in editing the *Histories* he has been much more judicious, and, for the most part, preference is given to the readings of L only when they seem intrinsically to merit acceptance. In most cases these readings already stand in our texts, though they are there ascribed, without acknowledgement to L, to scholars from the sixteenth century onwards. Elsewhere Koestermann, following L, departs from the reading of current texts; it is on these readings that discussion is most likely to centre. In spite of Eriksson's attempt to defend the Medicean's trucidatus (i. 43) as a finite verb, Koestermann seems right in accepting the trucidatur of L. At ii. 41 uolitantiumque (L) or the participle of some verb of motion seems needed, while pignora societatis (L) in iv. 61. 3 may possibly be validated by the use of the same phrase in c. 79. But, to give only one or two instances where Koestermann's adherence to L seems mistaken, occludit (i. 33. 1—the compound verb not elsewhere in Tacitus) is inferior on all counts to M's cludit; iii. 2. I contionator cannot be defended by a reference to its occurrence in Cicero—it is the wrong word in the present context; and segnities, not otherwise in Tacitus, should not be introduced as an alternative to segnitia on the strength of the orthography of L.

In short Koestermann has produced a text that is both stimulating and controversial. When it comes to be revised, Koestermann would put scholars still further in his debt if his apparatus criticus could give some indication whether a reading of L is unique or shared with other manuscripts. The examples given above from i. 51–60 show how important this information is for assessing the value and independence of L.

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### GREEK METRIC

CARLO DEL GRANDE: La metrica greca. (Enciclopedia Classica, sez. ii, vol. v, tomo 2.) Pp. 381. Turin: Società Editrice Internazionale, 1960. Cloth, L. 7,500.

'La metrica greca' forms the second 'tomo' of the fifth volume of the Enciclopedia Classica, Section ii (Language and Literature). It is nearly three times as long as the first 'tomo', a History of the Greek Language, but the author explains that metric is the sphere in which scholarship has diverged most widely, so that he felt obliged to give some account of its laboriously uncertain progress hitherto and then to tackle the problem from its foundations once more. This can only be done by a proper historical method, starting from the ancient grammatical tradition, which has to be understood and interpreted with discrimination.

Part i gives the basic assumptions ('presupposti'), history, and critical foundations of the subject; Part ii is systematic and descriptive, and there are appendixes on prose rhythms (vitiated by faulty scansion), music, and Byzantine metric. Part i starts with definitions, the main principles of prosody (Koster's account is better and more complete), and the sources ('fonti'), which are (a) the texts of the poets, (b) the accounts of ancient musicologists and metricians, (c) musical documents. There is no discussion of the limited sense in which (b) can be taken as a source for *metric* as distinct from metrical theorizing, though an analogous distinction has obviously to be made in all branches of Greek artistic practice and theory. The following history of metrical scholarship is largely the author's 'Panorama' (on which cf. Lustrum ii, 'Greek Metric', 25) brought up to date. Some of the judgements on recent work are a trifle idiosyncratic: Headlam-Thomson and Kolář are grouped together as showing the clearest intuition of the union of Greek rhythmic and metric (is this flattering to H.-T., who after all know their Greek quantities?): Dale reads like a cautious and negative reassertion of official Oxford and Cambridge orthodoxy, rather shaken by the bold attack of Thomson; Martin's is a more substantial and intelligent work, independent of organized university circles; though Snell's is precise and useful he is blind to the real nature of 'Singverse'. Italian studies are treated separately, which is reasonable, since the work is mainly for Italian readers.

Foundations' is an important chapter, summarizing the areas of agreement and divergence—the latter mostly in the structure of choral lyric: the interpretation of this in terms of metrical elements discovered by philological analysis is largely a philological legend grown up from Maas to Snell, and rests on (1) the rejection of the testimony of ancient metricians as confused and useless, (2) the incommensurability of ancient Greek and modern musical rhythms, (3) insistence on the 'Vers' as the only valid rhythmic unity. (The accused might plead guilty to (1) and (2), though not (3).) His own interpretation is based primarily on Damon. There are two questions here: how far can the deliberately loose and unprofessional quotation of Damon's views by 'Socrates' be pressed, and is what lies behind it a statement of past and contemporary poetic practice or the ideal of an ethical teacher? The meaning is in any case highly controversial, and it takes del Grande a good deal of pushing and pulling to make Damon's  $\dot{\eta}\rho\hat{\varphi}os$  mean cretic-bacchiac.

 median caesura in stichic verses is also explained by the need to take breath, so that it becomes an analysis not of metrical cuts but of rhetorical pauses, and we are told that, for example,  $d\epsilon l \mu \epsilon \nu$ ,  $\tilde{\omega} \pi a \hat{\iota} \Lambda a \rho \tau lov$ ,  $\delta \epsilon \delta o \iota \kappa \dot{a} \sigma \epsilon$  has no proper caesura.)

It is unfortunately true that metrical studies are a record of profound disagreements, and the question is what can best be done to build up the widest possible area of verifiable, self-coherent knowledge which may gradually command a more general assent, and form a basis for further development. For del Grande the first requirements are a knowledge of the sources, a firm hold on the principle that the laws of rhythm are eternal and immutable, and caution in forming hypotheses. But prior to any of these is surely an accurate knowledge of Greek quantity and Greek laws of prosody, and the utmost meticulousness in observing and in formulating the results of observation. In these respects the present work is lamentably deficient. μαρτύρεται - Ο Ο -, κἀγώ Ο -, δάμνᾶται, φάσιν  $\circ \circ$ ,  $\mu \epsilon \gamma \dot{\alpha} \lambda$ '  $\dot{\alpha} \chi \eta \circ \circ - -$ ,  $\dot{\alpha} \theta \bar{\iota} \mu \dot{\epsilon} \nu \omega \nu$ ,  $\dot{\gamma} \dot{\iota} \nu \epsilon \tau \alpha \iota$  are a random selection from the not very numerous illustrative quotations. Of the iambic trimeter we are told that tribrachs are rare in the sixth foot, almost never found in the fifth (only in Sophocles), that dactyls are found in the same positions as tribrachs, most commonly in the first and third, sometimes in the second and fourth, very rarely in the fifth, that Wilamowitz discovered a law that a verse ending in two dissyllables --/- is rare (this is G.V., p. 289, on the iambographers), so that such verses would strictly be considered imperfect, but that, for example, Soph. O.T. 463  $\mu\eta\delta\dot{\epsilon}\nu$   $\phi\rho\sigma\nu\dot{\epsilon}\hat{\nu}\nu$  gives extra weight to the end of the speech and the scene. Anapaests are treated under lyric rhythms, and a series of dimeters may be followed by a monometer 'as clausula', e.g. Agam. 40-41. Ar. Vesp. rhythms are illustrated by  $\phi \acute{\epsilon} \rho$ '  $\mathring{v} \delta \omega \rho$ ,  $\phi \acute{\epsilon} \rho$ '  $o \mathring{i} v o v$ ,  $\mathring{\omega} \pi a \hat{\imath}$ ,  $\phi \acute{\epsilon} \rho \epsilon \delta$ '  $\mathring{a} v \theta \epsilon \mu \acute{o} \epsilon v \tau a s$ fifth strophe has an 'extra syllable' in each of the first two cola:

> ή οὐχ ὁρῆς; ὁ μὲν κέλης ------Ἐνετικός: ἀ δὲ χαίτα ------

The author says we cannot recreate the living whole of words+rhythm+ music, but its general character can be rediscovered by philological and historical research, given an ear for the flow of the rhythm. But an ear for Greek rhythm can be cultivated only by the constant and attentive reading and rereading of Greek verse and prose with the proper quantities and prosody.

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A. M. DALE



Review: Greek Prosody Author(s): Philomen Probert

Reviewed work(s): The Prosody of Greek Speech by A. M. Devine; L. D. Stephens

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of classical scholarship), in which the intended audience probably needs more introduction and more guidance to authoritative resources? Perhaps I misjudge the German audience. In any case, for introducing English-speaking graduate students to most of the covered topics, we are not badly served in most areas by existing separate resources in English (among the exceptions are Byzantine literature and palaeography/codicology of Greek minuscule books).

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DONALD J. MASTRONARDE

#### GREEK PROSODY

- A. M. DEVINE, L. D. STEPHENS: *The Prosody of Greek Speech*. Pp. xvii + 565. New York and Oxford: Oxford University Press, 1994. \$60/£42. ISBN: 0-19-508546-9.
- '... even an approximately correct pronunciation of [Greek] is impossible, particularly in respect of the musical accent. . . . The same applies to rhythm.' These words of Maas (*Greek Metre*, tr. H. Lloyd-Jones [Oxford, 1962], pp. 55–6) are quoted by Devine and Stephens (p. vii) to illustrate the pessimism that often accompanies thoughts about our knowledge of the sound of ancient Greek, especially its prosodic aspects.
- D. & S. challenge this attitude by approaching Greek prosody with 'a rather different methodology—a sort of archaeological laboratory phonology' (p. vii), in fact by combining a wealth of typological data on prosodic systems with some fresh approaches to the Greek material. Studies of living languages, giving insights into the range of prosodic phenomena that occur, are continually exploited as sources of questions to ask of the Greek data and as a check on possible interpretations of those data. The authors have developed their methods over a period of twenty-five years, during which some of their conclusions have already been stated in several articles and a small monograph (see the list of their joint publications on pp. 561–2).

The book is not intended as an introduction to Greek prosody; for introductions the authors send us (p. x) to the standard works of W. S. Allen (*Vox Graeca* [Cambridge, 1987, 3rd edn]; *Accent and Rhythm* [Cambridge, 1973]). However, D. & S. summarize extensively the experimental and typological literature on prosody, envisaging that 'a concise yet fairly comprehensive account of this material with its associated bibliography might serve as a convenient source-book for future students and researchers' (p. vii). The quantity of literature cited should indeed make the book invaluable to anybody interested in tracking down studies relevant to prosody.

D. & S. begin with a chapter on the physiology of prosody, explaining how the brain, lungs, and vocal tract contribute to the production of pitch and rhythm. The rest of the book is arranged more or less by unit of speech, starting with the syllable and progressing to the foot, word, appositive group, minor phrase, major phrase, and utterance.

Three sources of evidence are particularly exploited: poetic metre, fragments of Greek music, and punctuated inscriptions. Statistically significant tendencies concerning the placement of words in verse or the setting of words to music are regarded as

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reflecting facts about the language rather than merely about versification or musical composition.

Important claims include the following:

- (a) The rhythm of Greek speech is based on a fundamental pattern of alternating strong and weak syllables, independent of the pitch accent; in every word, the rhythm may be iambic or trochaic but cannot change within the word. Various devices, such as 'subordination' (placing a heavy syllable in a rhythmically weak position) and 'matrix formation' (mapping two light syllables onto one strong position) are used to map words of diverse shapes onto a template of alternating weak and strong positions (Chapter III).
- (b) By analysing statistical tendencies in the music of the Delphic hymns, the phonetics of the Greek pitch accent can be reconstructed in considerably greater detail than has hitherto been done. Thus, the pitch of successive accented syllables decreases during the overall course of a major phrase, with a slight boost at the start of any new minor phrase within it, but a grave accent blocks lowering of a following non-grave accent and words with emphatic focus fail to be lowered (pp. 402–8, 441–51, 479–80).
- (c) There are no unaccented proclitics. Function words (articles, negatives, etc.), particularly if short and light, tend to have a lower-pitched accent than content words (nouns, verbs, etc.), and the so-called proclitics are merely function words with rather strong accentual reduction (Chapter VII).

There is sometimes room for debate about the interpretation of data. D. & S. interpret Porson's Law, for example, as a constraint against full word boundary following a subordinated syllable (pp. 131–2). Since, however, long second anceps is freely permitted in the trimeter before caesura, they stipulate that 'the sort of phonological boundary associated with the caesura effectively blocked subordination' (p. 132). One should also consider purely metrical accounts of Porson's Law and related phenomena. Parker suggests, for example, that numerous metres avoid the rhythm  $\sim - - \mid - \sim$  verse-internally except at caesura and diaeresis because  $\sim -$  has characteristic finality;  $\sim - - \mid - \sim$  seems to halt and re-start (L. P. E. Parker, 'Porson's Law Extended', CQ N.s. 16 [1966], 1–26, esp. 24).

Some points of presentation cause irritation. Choices of technical terms to define or leave undefined are inconsistent, and some terms are explained only after being used several times ('mora', p. 47; 'onset' and 'coda', p. 53; 'rime', p. 54). For a book of potential value to researchers of languages other than Greek, untranslated Greek quotations are a drawback. Page numbers are rarely supplied with references. In other respects, however, the book has been well produced and proof-read. I noticed only two typographical errors.

The Prosody of Greek Speech aims to answer the question, 'What did Greek prosody sound like?' (p. v). The answers proposed are easier to grasp intellectually than to translate into practical performance, but rich enough in detail that a machine implementation of D. & S.'s model ought to make an exciting speech synthesis project for somebody with the relevant skills and facilities.

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PHILOMEN PROBERT



Review: [untitled]
Author(s): H. J. W. T.

Reviewed work(s): ΑΡΙΩΝ-ή Μουσική τῶν Ἑλλήνων ὡς διεσώθη ἀπὸ τῶν ἀρχαιοτάτων

χρόνων μεχρὶ τῶς σήμερονὑπὸ Α. Ρεμαντᾶ καὶ Π. Δ. Ζαχαρία Source: *The Journal of Hellenic Studies*, Vol. 39, (1919), pp. 236–236 Published by: The Society for the Promotion of Hellenic Studies

ΑΡΙΩΝ-ή Μουσική τῶν Ἑλλήνων ὡς διεσώθη ἀπὸ τῶν ἀρχαιοτάτων χρόνων μεχρὶ τῆς σήμερονὑπὸ Α. Ρεμαντᾶ καὶ Π. Δ. Ζαχαρία. 4to. Pp. xxxvi+63. Athens: Τύποις Ἐπαμ. Ζαγκουρόγλου, 1917. 12 drachmas.

The authors' declared aim is to dissipate the errors of certain Western musicians about Greek music, and to establish this branch of the art in the position that it deserves. Now Greek music may include the ancient Greek theory and surviving fragments, Byzantine church music, and finally modern Greek music, both ecclesiastical and popular. Something is said upon all these in this book, and specimens are given in European notation with a pianoforte accompaniment. For Western readers the main concern will be with the folksongs; and here we cordially welcome the effort made by the authors to stimulate the enthusiasm of their countrymen for their national music. We fully agree with the suggestion that Greek folksongs should form the basis of musical instruction in Greek schools. Many of these songs are of great beauty, and bear strongly-marked The idea, however, that such traits are directly features of rhythm and tonality. inherited from ancient Greece must be excused as a patriotic exaggeration. We feel sure that the native melodies of Hellas can stand on their own merits. In dealing with ancient music the authors keep to the orthodox lines. The examples are from Riemann and von Kralik, whose interpretations are adopted. Only one mediaeval hymn is printed; and, as the reference to the MS. (Athens National Library) is omitted, it is impossible to check the correctness of the rendering. There are six modern ecclesiastical The authors do not say whether they are entirely in favour of part-singing in the Greek Church. The first hymn  $(\phi \hat{\omega}_s i \lambda a \rho \hat{\omega}_r)$  is meant for treble and alto in thirds throughout (not a satisfactory arrangement): but the Κύριε ἐκέκραξα (p. 14) is for unison On the whole such a compromise is unlikely to succeed: hynns conceived by men who never dreamed of harmonization are far better sung as intended, i.e., in one moving part over a drone. The attempt of the authors to evolve laws of harmony for the various modes (as was done by S. G. Hatherly in his Treatise on Byzantine Music) is theoretically ingenious and might be useful to composers seeking in Greek music some The theoretical portion of the book also deals with inspiration for larger works. acoustics and the laws of harmony. The student of Modern Greek will be interested to see how easily that language renders the technical terms—a contrast to Russian, which has imported them wholesale from the West. The mediaeval mode-system is briefly discussed; but that of Chrysanthus (printed 1832) receives fuller treatment. authors condemn the latter for perpetuating confusions in tonality. Metre and rhythm We note that 5-time and 7-time occur in the folksongs (another are also dealt with. supposed legacy from ancient Greece). In Church music the authors incline to a measured tempo, contrary to tradition.

Forty-six folk-melodies form the chief attraction of the volume. (Seven of these are from Bourgault-Ducoudray, *Mélodies populaires de Grèce et d'Orient*.). The piano accompaniments (which are as a rule successful) will be justified if they encourage performance of the songs. The modal character of all the airs is carefully preserved.

The music and text are clearly and accurately printed. The introduction, written in the higher literary style, is generally lucid and free from pomposity. There is a full table of contents, but no index.

H. J. W. T.